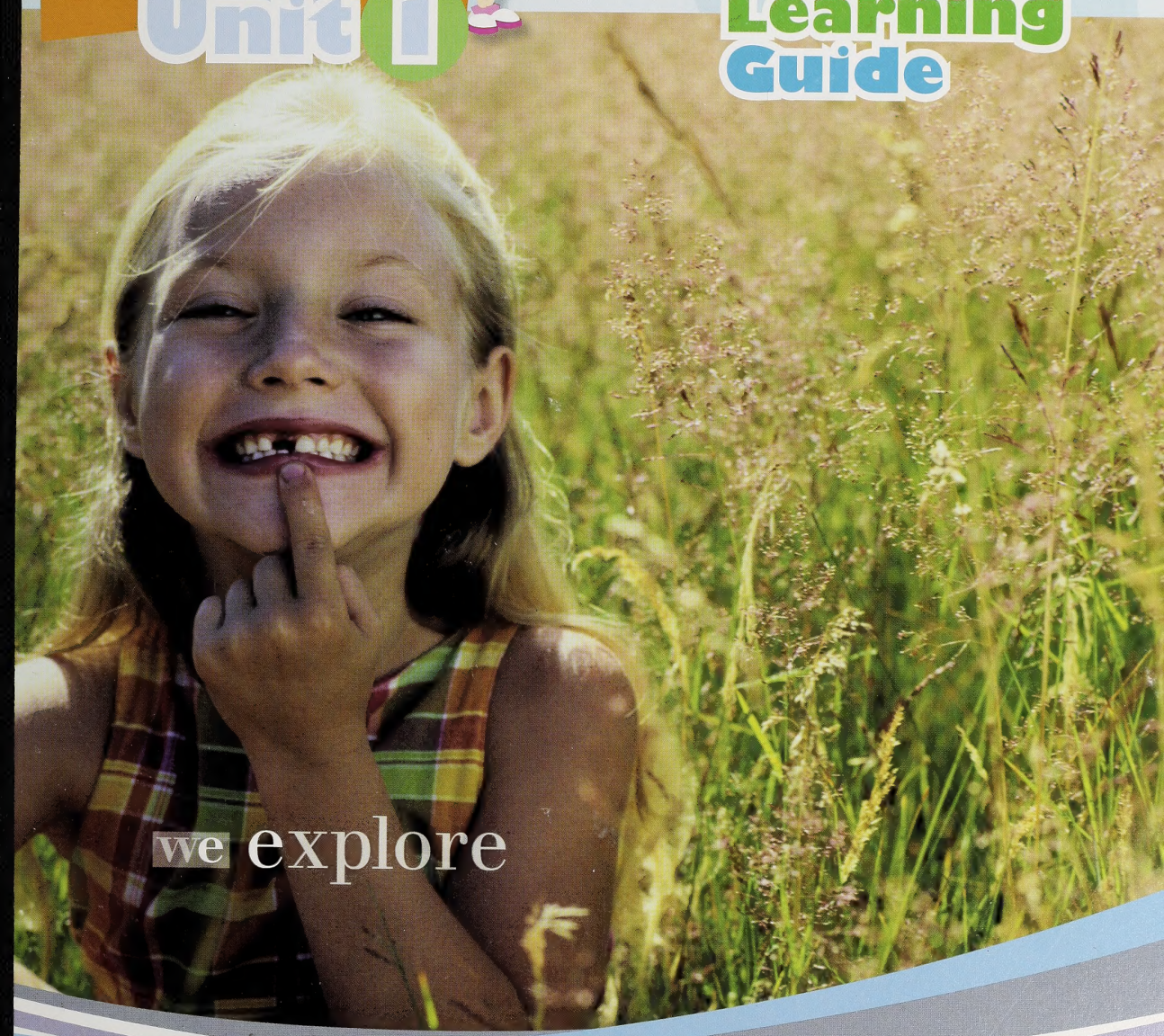
Learn EveryWare

Math 4 Unit 1

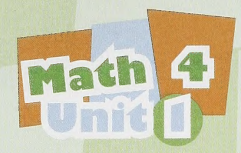
Student Learning Guide



we explore

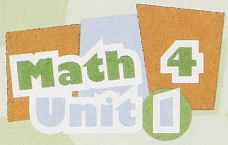
pilot®

Alberta Education



Math 4 Learn EveryWare – Unit 1 Student Learning Guide
ISBN: 978-0-7741-3047-9

Math 4 Learn EveryWare has been developed under the terms of an agreement with Etraffic Press® and Alberta Education – Distributed Learning Resources Branch.



Creator
Wayne Poncia

Author
Michelle Gainer

Contributing Authors
Nancy Claire Duchaine
Grant Mellemstrand
Lisa Read

Senior Editor
Dr. Mary Ellen Bafumo

Editor
Mary Dillon

Project Manager
Lara Fisher

Production Manager
Sandi van Katwijk

Print Design Coordinator
Carrie Burke

Animators
Rob Jones
Stephen McCallum

Multimedia Designers
Troy Lemberg

Senior Developer
Jenny van Hoof

Publisher K - 12
Dr. Barry Carbol

Publisher Professional Development
Dr. Elizabeth Childs

Math Editors
Harvey Knapp
Wayne Loutet

Proofreader
Leelan Stanjek

Assistant Project Coordinator
Julia Schenck

Product Coordinator
Robert Bailey

Production Designer
Sherif Sidky
Jacqueline Rimmer
Francisco Cumayas
Liviu Peicu

Flash Developers
Harry Kim
Ryan Thomson

Illustrator
Ingrid Mesquita

Etraffic Press® would like to acknowledge the production and project teams of Etraffic Solutions™ Inc. and The Distributed Learning Resources Branch for their contributions to the project management, design, editing and development of this publication.

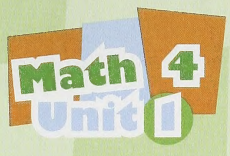
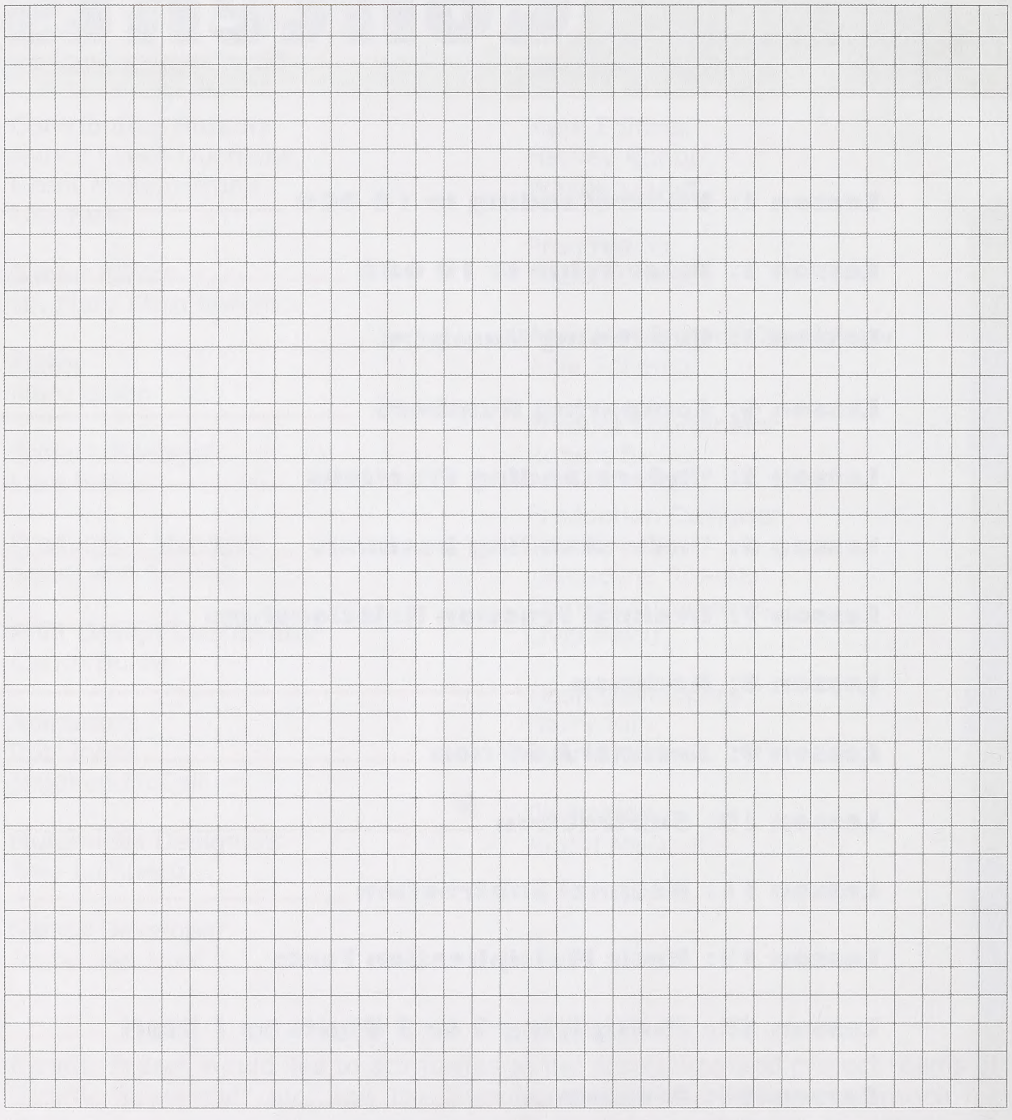


Table of Contents



Math 4 Unit 1

Lesson 1

Understanding to 10 000

Park Spaces

Peaks in Glacier National Park of Canada range from 2 600 metres to 3 390 metres in height. The park is over 1 349 square kilometres of beautiful steep mountains, lakes, glaciers and old-growth cedar. There are caribou, mountain goats and grizzly bears living in Glacier Park. There is so much space in the park!

Reflection

How long do you think it would take you to explore the 1 349 square kilometres? How high is 2 600 metres? How big are these numbers?

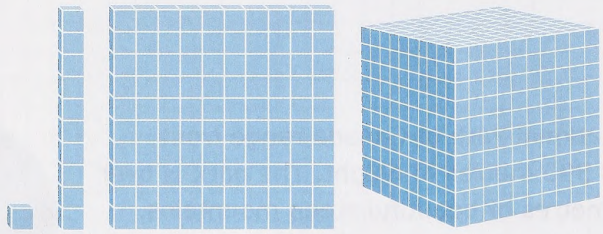
Objectives for this Lesson

In this lesson you will explore the following concepts:

- Represent and describe whole numbers to 10 000 using pictures and symbols.

Concrete Models

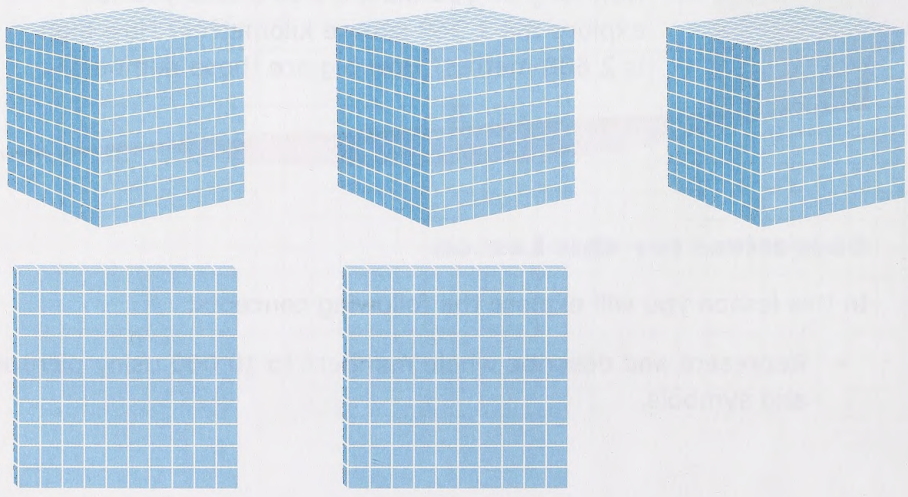
Concrete models are things that can be picked up and touched such as base 10 blocks. Base 10 blocks represent each of the different place values, such as ones, tens, hundreds, and thousands.



You can use concrete models in pictures to show large numbers. Models like these or many other types of models can represent large numbers in order to solve problems.

Example 1

Find the value of the given picture:



The first three blocks represent 1 000 and the last two represent 100.

Add up the values for each: 1 000 + 1 000 + 1 000 + 100 + 100

3 000 + 200 = 3 200

The answer is: 3 200

Go online to complete the Concept Capsule: Reading and Writing Numbers to 1 000.

If you know how much a picture represents, you can use it to represent larger numbers. Any picture may be used to represent a value in a problem.

 represents 10 baseballs

Daksha has 100 baseballs.

A picture model of Daksha's 100 baseballs:

Exploration 1: Building Large Numbers

Materials: Unit 1, Lesson 1, Exploration 1 page from your Workbook, Base 10 Blocks, Pencil

Draw a model for each of the following:

1. 4 500 2. 7 250 3. 8 425
4. How is the model of number 2 different from the model of number 1?
5. How is the model of number 3 different from the model of number 2?
6. Make up your own number between 5 000 and 10 000 and make a model of that number.
7. Enrichment: Lian made this model to represent 2 350. How much does each star represent?

Example 2

Alyssa has a gumball collection. Each full jar contains 1 000 gumballs. One jar pictured here is half full. How many gumballs does Alyssa have?

Start counting the full jars by 1 000s. You should find that there are 9 000 gumballs.

There is one jar that is half full. Half of 1 000 is 500 so that jar contains 500 gumballs.

You can add these two numbers together to get the total number of gumballs:

9 000 + 500 = 9 500

Alyssa has a total of 9 500 gumballs.

Picture representations can be used to solve word problems involving large numbers.

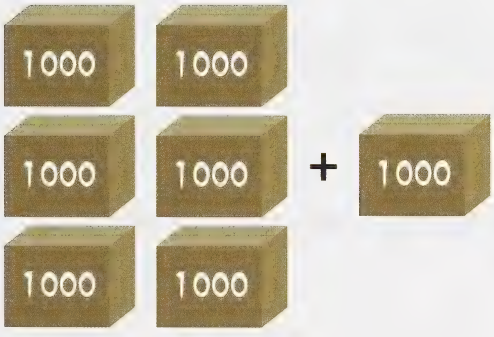
Example 3

A store owner buys snow globes by the case. Each case contains 1 000 snow globes and she needs 6 700 snow globes. How many cases will the store owner need to order? Draw a picture to solve.

How many full cases will she need?

If 6 cases are ordered the store owner will have 6 000 snow globes and be short by 700.

Snow globes can only be ordered by the case. The store owner will need to order an extra case to get the 700 extra snow globes. She will have to buy a total of 7 000 snow globes. This is more than the store owner needs. This is the only way to get the additional 700 snow globes needed.



The retailer will have to order 7 cases of snow globes.

Example 4

Daksha and Nina are playing a game of cards. To keep score they use tally marks to represent every 10 points they earn. How many points does each of them have?

Daksha

Nina

Here is a series of questions to investigate:

What does the picture represent?
One tally is equal to 10 points:

 = 10

What does one grouping of tally marks represent?
One grouping is equal to 10 + 10 + 10 + 10 + 10 = 50

 = 50

What is the sum of each grouping?

Daksha

 50 + 50 + 10 + 10 = 120

Nina

 50 + 50 + 10 + 10 + 10 + 10 = 140

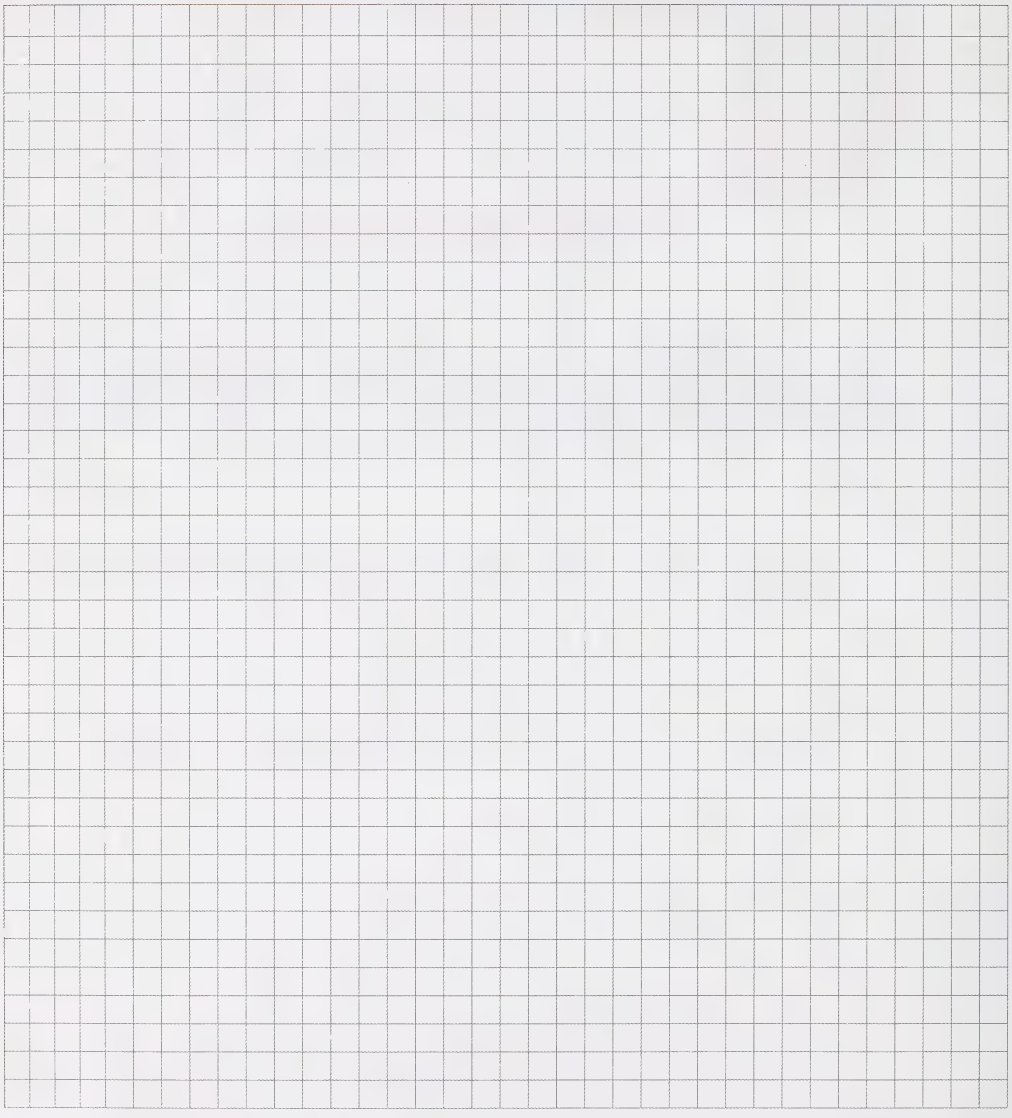
The answer is: Daksha has 120 points and Nina has 140 points.

Reflection

What other symbols can you use to represent large numbers?

Let's Practice

- In your Workbook go to Unit 1, Lesson 1 and complete 1 to 11.



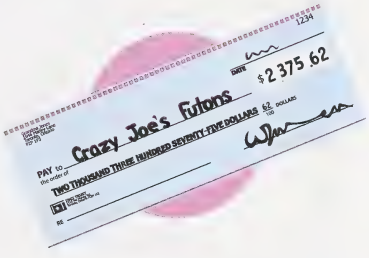
Lesson 2

Place Value to 10 000

Writing Cheques

Have you ever received a cheque from your grandparents for your birthday? If they have to mail money, they may send a cheque.

Did you know that people, small businesses and big companies all have something in common?



Everyone needs to pay bills or send money through the mail. Cheques can be used to send money by mail and pay employees. 500-600 billion cheques are written each year. It is very important that the numbers are written correctly. If you make a mistake it can create many problems. There are two ways that you must write the amount of the cheque. Look at the cheque and see if you can find the two ways.

Reflection

In what ways are numbers expressed on a cheque?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Write a given numeral 0-10 000 in words
- Represent a given numeral, using a place value chart or diagram

Place Value

Each digit in a number has a place value. The value of the digit depends on its position in the number.

You can use place value and **periods** to read and write numbers to the thousands.

A period is a grouping of numbers. Each period has 3 digits: one, ten and hundred.

Numbers may be written in words. In words there is a comma between each period.

Written form: forty-five thousand, seven hundred sixty-three

In standard form the periods are separated by a space. Standard form is the way we are used to seeing numbers in math class.

Standard form: 45 763

This table shows the value of each place as well as the name of the period:

Period	Thousands			Ones	
Place	Ten	One	Hundred	Ten	One
Value	10 000	1 000	100	10	1

What do you think is the place value in front of the ten thousands? If you said hundred thousands, you are right! This place value makes up the last place in the thousands period.

Reflection

What period do you think would be in front of the thousands period? How often do you encounter numbers that big?

Writing Numbers Using Place Value

You need to know how to convert between a number written in words and standard form. It is also important that you are able to read a number based on its place value.

Example 1

Write the number 54 321 in words.

Figure out where each number fits in the place value chart. Remember to

start with the ones column and write only one digit in each place.

Ten Thousands	Thousands	Hundreds	Tens	Ones
5	4	3	2	1

To write the number in words put a comma between the period for the thousands and the hundreds.

If you read the thousands period out loud you would say "fifty four thousand."

The remaining digits are part of the ones period. You would say "three hundred twenty one."

Now put the two parts together: Fifty four thousand, three hundred twenty one

Example 2

Write eighty thousand, two hundred fifty three in standard form.

Figure out where each number fits in the place value chart.

Ten Thousands	Thousands	Hundreds	Tens	Ones
8	0	2	5	3

Write the number in standard form.

Leave a space between the thousands period and the hundreds period: 80 253

Example 3

Write sixteen thousand, seventy six in standard form.

Figure out where each number fits in the place value chart:

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	6		7	6

The seventy six may give you trouble. When the word "hundred" does not appear there will be no value in the hundreds place. "Seventy" is seven tens. "Six" is the ones value.

Put zeros in all empty place values and then write the number in standard form.

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	6	0	7	6

In this number, 0 has a very important job - it is called a place holder. It "holds" the hundreds place so that the 6 can be in the thousands place.

Write the number: 16 076

- In your Workbook go to Unit 1, Lesson 2 and complete 1 to 6.

Value of Digits

You need to understand the value of each digit in a number. The value is related to its place in the number.

Example 4

What is the value of each digit in 12 679?

Use a place value chart to help you identify the value of each place. Remember to start with the ones place and write only one digit in each place.

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	2	6	7	9

You can use the place value chart to find the value of each digit:

The 1 is in the ten thousands place and its value is 1 x 10 000 = 10 000

The 2 is in the thousands place and its value is 2 x 1 000 = 2 000

The 6 is in the hundreds place and its value is 6 x 100 = 600

The 7 is in the tens place and its value is 7 x 10 = 70

The 9 is in the ones place and its value is 9 x 1 = 9

Here is a chart that represents the values as well:

Number	Place	Value
1	ten thousands (x 10 000)	10 000
2	thousands (x 1 000)	2 000
6	hundreds (x 100)	600
7	tens (x 10)	70
9	ones (x 1)	9

Example 5

Write the number 60 401 in words and name the value of each digit.

Figure out where each number fits in the place value chart:

Ten Thousands	Thousands	Hundreds	Tens	Ones
6	0	4	0	1

Write the number in words: sixty thousand, four hundred one

Use the place value chart to find the value of each digit.

Here is the value of each digit:

Number	Place	Value
6	ten thousands (x 10 000)	60 000
0	thousands (x 1 000)	0
4	hundreds (x 100)	400
0	tens (x 10)	0
1	ones (x 1)	1

Example 6

What is the value of the orange digit in each number?

a. 42 673

Figure out where each number fits in the place value chart:

Ten Thousands	Thousands	Hundreds	Tens	Ones
4	2	6	7	3

Find the value of the specific digit.

4 is in the ten thousands place therefore its value is
4 x 10 000 = 40 000

b. 16 789

Figure out where each number fits in the place value chart:

Ten Thousands	Thousands	Hundreds	Tens	Ones
1	6	7	8	9

Find the value of the specific digit.

6 is in the thousands place therefore its value is 6 x 1 000 = 6 000

Let's Explore

Exploration 1: Writing Numbers in Standard and Word Form

Materials: Unit 1, Lesson 2, Exploration 1 page from your Workbook, Paper, 10 index cards, Marker

Most people do not have a lot of cash with them everyday. This means they may write a cheque to pay for something. If you are sending money, you shouldn't mail cash. You will need to mail a cheque instead.

In this activity you will use the index cards to help you create numbers. You will then write the numbers in standard and word form - just like you do on a cheque. You can complete this activity as an individual or with a partner. If you are working with a partner have him or her check your work when you have completed each problem.

1. Write the digits 0 - 9 on the index cards using your marker. There should be one card for each digit. Shuffle the cards like you would a deck of playing cards. Stack them in a pile face down.
2. Draw the top five cards and lay them in row face up. Use your marker to write the 5 digit number you just created in standard form on the your paper.
3. Write that same number in word form on the paper using your marker.
4. Reshuffle all 10 index cards and start the process again. Repeat instructions 2 and 3, 5 times. Save your index cards when you are finished. You will use them again later.

Let's Practice

- In your Workbook go to Unit 1, Lesson 2 and complete 7 to 19.

Go online to complete the Concept Capsule: Place Value to 100 000.

Lesson 3

Expanding Numbers

Guide Dog Services

There are many people who are blind or visually impaired in our world. Charities work to help make the lives of these people better. They can raise money to help provide guide dog services.

Dogs are bred, raised and trained to service blind people. After they are trained, the dogs are matched up with people. This process is a very long and expensive one. It usually costs more than $37 750 for each partnership. People give money to the charities to help pay for the dogs and the training.

One group decided to set up a table at a shopping mall. They used it to showcase the guide dog services. They also accepted donations. At the end of the day they had collected the following donations.

Amount	Number of Donations	Total
$1	9	9
$10	7	70
$100	8	800
$1 000	2	2 000
$10 000	1	10 000

They added up the donations at the end of the day.

The total was: 10 000 + 2 000 + 800 + 70 + 9 = $12 879

Reflection

Do you think large numbers are always this easy to add? What makes these numbers easy to add?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Express a given numeral in expanded notation
- Write the numeral represented by expanded notation

Go online to watch the Notepad Tutor: Adding Many Numbers.

Expanding Numbers

Expanded notation is used to write numbers. It shows the place value of each digit. You should remember place value charts from Lesson 2. The chart shows each digit of a number in its appropriate place value.

Place	Ten Thousands	Thousands	Hundreds	Tens	Ones
Value	10 000	1 000	100	10	1

The value of a digit in the thousands place is equal to 1 000 times the digit.

To write a number in expanded notation you find the values of each digit. A + sign is used between the value of each digit.

Standard form: 1 234

Expanded notation: 1 000 + 200 + 30 + 4

Reflection

What is the value of a digit in the tens place? What is the value of a digit in the ten thousands place?

Example 1

There are 1 367 students at Happy Valley Elementary School.

Write 1 367 in expanded notation.

You can use a place value chart to determine the place value of the digits.

Ten Thousands	Thousands	Hundreds	Tens	Ones
	1	3	6	7

Determine the value of each digit.

The 1 is in the one thousands place, so its value is 1 x 1 000, which equals 1 000

The 3 is in the hundreds place, so its value is 3 x 100, which equals 300.

The 6 is in the tens place, so its value is 6 x 10, which equals 60.

The 7 is in the ones place, so its value is 7 x 1, which equals 7.

(1 x 1 000) + (3 x 100) + (6 x 10) + (7 x 1) = 1 000 + 300 + 60 + 7

1 367 in expanded notation: 1 000 + 300 + 60 + 7

Example 2

Last summer, 5 205 hikers used the trails at the park.

Write 5 205 in expanded notation.

Use a place value chart to determine the place value of each digit.

Ten Thousands	Thousands	Hundreds	Tens	Ones
	5	2	0	5

Each digit is multiplied by the value of the place that it is in:

(5 x 1 000) + (2 x 100) + (0 x 10) + (5 x 1) = 5 000 + 200 + 5

Notice that the value of the tens is zero. There will be no number in the tens place for expanded notation.

Example 3

Lian used a pedometer to find out how many steps she was taking. She found that in one week she took 65 000 steps. Write 65 000 in expanded notation.

Use a place value chart to determine the place value of each digit.

Ten Thousands	Thousands	Hundreds	Tens	Ones
6	5	0	0	0

Each digit is multiplied by the value of the place that it is in:

$(6 \times 10\,000) + (5 \times 1\,000) = 60\,000 + 5\,000$

Reflection

How do you know if a place value will not appear in expanded notation?

Standard Form

Standard form is the way you normally write numbers.
You can also write them using expanded notation.

Example 4

Write 1 000 + 900 + 50 + 4 in standard form.

The value of each number is already identified.

Start with the first value: 1 000

This will be the first digit. 1 000 is like saying 1 x 1 000.

This means it should be placed in the thousands place:

Thousands	Hundreds	Tens	Ones
1			

The next value is 900. This is like saying 9 x 100. The digit 9 will be in the hundreds place:

Thousands	Hundreds	Tens	Ones
1	9		

Now place the digit 5 in the tens because 50 = 5 x 10:

Thousands	Hundreds	Tens	Ones
1	9	5	

The 4 is the ones digit:

Thousands	Hundreds	Tens	Ones
1	9	5	4

1 000 + 900 + 50 + 4 = 1 954

Another way to write expanded notation numbers in standard form:

Example 5

Write 10 000 + 4 000 + 500 + 80 + 3 in standard form.

Line up the last place of each value like this:

10 000
4 000
500
80
3

Now add up the values: 14 583

Be careful when converting into standard form from expanded notation. Make sure that you have a digit for each place value. This means you may have to use zero. Create a place value chart to help you understand the numbers.

Example 6

Write 20 000 + 4 000 + 500 + 8 in standard form.

Start with the place value of the values given.

Ten Thousands	Thousands	Hundreds	Tens	Ones
2	4	5		8

Since there is no number in expanded notation for the tens – put a 0 there.

Ten Thousands	Thousands	Hundreds	Tens	Ones
2	4	5	0	8

The answer is: 24 508

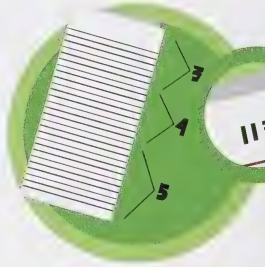
Let's Explore

Exploration 1: Making a Folding Book

Materials: Unit 1, Lesson 3, Exploration 1 page from your Workbook, 1 sheet of lined notebook paper, Pencil, Scissors

In this Exploration you will be making a type of book that shows numbers written in standard form and expanded notation.

1: Fold a sheet of notebook paper in half like a hotdog. On one half of the page cut on the top line from the outside edge of the paper to the crease. Make the same type of cut on every third line of the paper down to the bottom of the page. You should make about 9 cuts.



2: Lay your paper down on the table with the cut pieces on top. You should lay it so that it wil open like a book.

3: Write one number on each flap. On each of the first three flaps write 3 digit numbers. On the next three flaps, write 4 digit numbers and on the last four flaps, write 5 digit numbers.

4: Open one flap at a time and write the number in expanded notation for the number that you wrote on top of the flap.

Use this folded book to review before taking your test.

Now It's Your Turn

Complete the following questions in expanded notation:

a. 1 753 = (___ x 1 000) + (___ x 100) + (___ x 10) + (___ x 1) =
_____ + _____ + _____ + _____

b. 5 690 = (5 x _____) + (6 x _____) + (9 x ___) = _____ +
_____ + _____

Write in expanded notation:

c. 75 318

d. 50 972

Write the following in standard form. Be sure to create a place value chart:

e. 10 000 + 3 000 + 70 + 6

Solutions

a. 1 753 = (1 x 1 000) + (7 x 100) + (5 x 10) + (3 x 1)

b. 5 690 = (5 x 1 000) + (6 x 100) + (9 x 10)

c. 75 318 = (7 x 10 000) + (5 x 1 000) + (3 x 100) + (1 x 10) + (8 x 1) =
70 000 + 5 000 + 300 + 10 + 8

d. 50 972 = (5 x 10 000) + (9 x 100) + (7 x 10) + (2 x 1) = 50 000 +
900 + 70 + 2

e. 13 076

Let's Practice

- In your Workbook go to Unit 1, Lesson 3 and complete 1 to 16.

Lesson 4

Comparing Numbers

Wild about Hockey

Each year large numbers of fans go to arenas to watch their favourite teams play hockey. There are many tournaments played each year. It is a lot of work to plan a tournament. The person who has that job is called an Event Planner. An Event Planner has to make sure that the arena is large enough to hold all of the fans who want to come to the game. Look at the following chart:

Arena	Seating Capacity
Pengrowth Saddledome	19 289
Rexall Place	16 839
Bell Centre	21 273
Scotiabank Place	19 153
Air Canada Centre	18 819
General Motors Place	18 630

If you were the Event Planner, which arena would you choose to hold 17 890 fans? Which arena would you choose if 19 500 fans want to attend?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Compare numbers to 10 000
- Order numbers to 10 000

Go online to watch the Notepad Tutor: Compare and Order Numbers (to 1 000).

Comparing Numbers

You will use a lot of different symbols to work with numbers. You probably know some already.

+ − x ÷ =

These are all math symbols. There are also symbols to show less than and greater than. These symbols are called **inequalities**. They show that the relationship between numbers is not equal.

Look at the beginning of a number line where the numbers are the smallest. This arrow is the symbol for **less than**. <

Look at the end of the number line where the numbers are the largest. This arrow is the symbol used for **greater than**. >

Symbol	Meaning
<	Less Than
>	Greater Than

You read a math sentence just like any other sentence, from left to right. The sentence "two is less than twenty-five" can be written as the math sentence:

$2 < 25$

Example 1

Compare. Write >, <, or = in the ◯.

145 ◯ 154

Is 145 greater than 154? Is 145 less than 154?

Remember that you can line up the numbers and compare each place value.

Compare: Start from the left.

Hundreds	Tens	Ones
1	4	5
1	5	4

The hundreds are the same

4 tens are less than 5 tens

That should tell you that 145 is less than 154.

145 < 154

Now It's Your Turn

Compare using <, >, or =. Remember to use a place value chart.

a. 1 238 _____ 1 235

b. 483 _____ 483

c. 6 288 _____ 6 822

Solutions

a. >

b. =

c. <

Let's Practice

- In your Workbook go to Unit 1, Lesson 4 and complete 1 to 10.

Let's Explore

Exploration 1: Create and Compare Numbers

Materials: Unit 1, Lesson 4, Exploration 1 page from your Workbook, One die, Pencil

In this Exploration you will use a die to help you to create two 5 digit numbers. After you create these numbers you will compare them and answer questions.

1: On your Workbook page find Problem 1. You will see two rows: Row A and Row B. Each row has 5 lines. Roll the die and write the number rolled on one of the lines in Row A. Repeat this until all blanks have a number.

2: Repeat the same process from number 1 until Row B has five numbers.
You have now created two 5 digit numbers.

3: Compare the two numbers and answer the following questions:
Which number is larger?
Explain how you know which number is larger.
Which place value position determined your answer?

4: Repeat the process of creating and comparing two 5 digit numbers for the rest of the problems.

Ordering Numbers

Comparing numbers will help you order numbers.

Daksha and Cameron are going to lunch with their parents. Their parents are given a number. When their number is called they will get a table.

Have you ever had a number to let you know when it is your turn? Sometimes the numbers are really large. They may not start over each day.

Reflection

How do you put large numbers in order from least to greatest?

Example 2

Order the numbers 4 652, 5 642, 5 624, and 5 462 from least to greatest.

You can use a place value table to organize your numbers.

Thousands	Hundreds	Tens	Ones
4	6	5	2
5	6	4	2
5	6	4	2
5	4	6	2

You are looking for the smallest number. Start with the thousands place and find the smallest digit in that column. The 4 is the least digit in the thousands place. This means that 4 652 is the smallest number:

4 652, _____, _____, _____

The rest of the numbers have a 5 in the thousands. Now you want to compare the hundreds place. Ignore the number you have already placed. The smallest digit here is 4 in the number 5 462 so it goes next:

4 652, 5 462, _____, _____,

Now in the tens, the smallest number is the 2 in the number 5 624 so that will be next, leaving 5 642 for last:

The answer is: 4 652, 5 462, 5 624, 5 642

Example 3

Order the numbers 5 864, 4 685, 5 684, and 8 465 from greatest to least.

You can use a place value table to organize your numbers.

Thousands	Hundreds	Tens	Ones
5	8	6	4
4	6	8	5
5	6	8	4
8	4	6	5

Start with the largest place. Since 8 is the greatest digit in the thousands place, 8465 is the greatest number.

8 465, _____, _____, _____

The next thousands digit is 5. There are 2 numbers with a 5 in the thousands: 5 864, 5 684. So go to the hundreds place. The greatest value for the hundreds place for these two numbers is 8 so the next number is 5 864.

8 465, 5 864, _____, _____

You know 5 684 is next since the thousands are the same.

8 465, 5 864, 5 684, _____

That leaves 4 685 as the smallest or least number.

8 465, 5 864, 5 684, 4 685

Let's Practice

- In your Workbook go to Unit 1, Lesson 4 and complete 11 to 17.

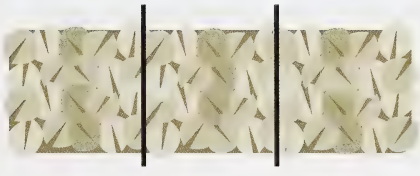
Lesson 5

Understanding Fractions

Sharing Candy

Cameron has a granola bar that is shaped like a rectangle:

He wants to share the granola bar with Daksha and Zach. He wants all three of them to have the same amount. He separates the granola bar like this:



There are now 3 equal parts of the granola bar.

Reflection

When the boys put all three pieces together, what part of the whole do they have?

Objectives for this Lesson

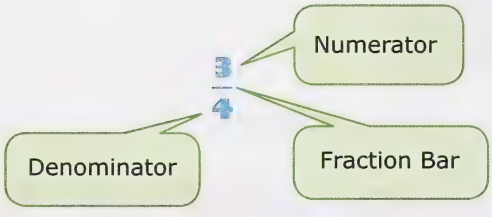
In this lesson you will explore the following concepts:

- Demonstrate an understanding of fractions less than or equal to one
- Name and record fractions for the parts of a whole or a set
- Model and explain that for different wholes, two identical fractions may not represent the same quantity
- Compare and order fractions
- Provide examples of where fractions are used in the real world

Parts of a Whole

A **fraction** describes a part of a whole when the whole is cut into equal parts. Fractions can also be parts of a group.

Every fraction has two parts separated by a fraction bar. The number above the bar is called a **numerator** and the part below is called a **denominator**.



The denominator represents the total number of items in a group. It may also represent the total number of pieces in a whole that is being described. The numerator describes the part you are looking for.

Example 1

Daksha has 3 oranges and 4 apples:

a. How many of the group are apples?
There are 4 apples

b. How many of the group are oranges?
There are 3 oranges.

c. How many are in the whole group?
There are 7 total.

d. What fraction are oranges?
Put the number of oranges in the numerator and the total number in the denominator:

$$\frac{\text{Number Oranges}}{\text{Total Number of Fruit}} \longrightarrow \frac{3}{7}$$

$\frac{3}{7}$ are oranges

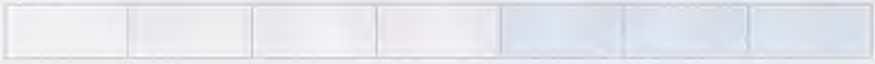
e. What fraction are apples?
Put the number of apples in the numerator and the total number in the denominator:

$$\frac{\text{Number Apples}}{\text{Total Number of Fruit}} \longrightarrow \frac{4}{7}$$

$\frac{4}{7}$ are apples

Fraction Models

Fractions may be used to describe an item separated into equal parts. Look at the rectangle below. It has been divided into seven equal parts.



3 out of 7 parts are shaded blue. $\frac{3}{7}$ is shaded.

4 out of 7 parts are not shaded. $\frac{4}{7}$ is not shaded.

One Whole

If a circle represents one whole then the fraction can be represented as $\frac{1}{1}$. This works because the numerator is the number of parts shaded. 1 part is shaded. The denominator is the total number of parts. There is only 1 part.

Exploration 1: Parts of a Whole

Materials: Unit 1, Lesson 5, Exploration 1 page in your Workbook, Pencil, Paper

1. Draw four equal parts on the circle. Shade all 4 parts.
2. What is the denominator for a fraction represented by this circle?
3. What is the numerator?

4. Write the fraction for the shaded part of the circle.
5. Draw 8 equal parts on the circle.
6. What is the denominator for a fraction represented by this circle?
7. What is the numerator?
8. Write the fraction for the shaded part of the circle.
9. Reflect: What would happen if you separated a circle into 12 parts and shaded 12? What would be the fraction of the shaded parts?
10. Reflect: What if you shade 30 out of 30 parts?

Part of a Set

Look at the set of stars.

Ask yourself:
How many stars are there in all?
The answer to this question is the denominator.

There are 6 stars. The denominator will be 6.

How many are blue?

This answer is the numerator.

There are 4 blue stars. The numerator will be 4. $\frac{4}{6}$ of the stars are blue.

Number Blue Stars →
Total Number of Stars →

$= \frac{4}{6}$

Let's Explore

Exploration 2: Parts of a Set

Materials: Unit 1, Lesson 5, Exploration 2 page in your Workbook, A package of small multi-coloured objects.

1. What are the colours of the objects in your package?
2. List the colours in the table.
3. What is the number of each object in the package? Complete this information in the table.
4. How many objects are there in all?
5. Write a fraction for the part of the package each colour makes.
6. Reflect: How are parts of a set different from parts of a whole? How are they the same?

Example 2

Nina has part of a pizza. Write a fraction for the part of the pizza that is left.

What is the denominator?

Ask yourself: How many parts are there in the whole? In this case, how many pieces of pizza did Nina start with? 4

What is the numerator?

Ask yourself: How many pieces are left? 3

The part of the pizza that Nina has is $\frac{3}{4}$.

Go online to complete the Concept Capsule: Understanding Identical Fractions.

- In your Workbook go to Unit 1, Lesson 5 and complete 1 to 13.

Writing Names of Fractions

Look at the Fraction Strips and see how each fraction is read.

One Whole	1											
One-Half	$\frac{1}{2}$										$\frac{1}{2}$	
One-Third	$\frac{1}{3}$					$\frac{1}{3}$					$\frac{1}{3}$	
One-Fourth	$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$		
One-Fifth	$\frac{1}{5}$		$\frac{1}{5}$			$\frac{1}{5}$			$\frac{1}{5}$			$\frac{1}{5}$
One-Sixth	$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$	
One-Eighth	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$				
One-Ninth	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$			
One-Tenth	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$		
One-Twelfth	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

If you have more than one piece of a strip then you would name the fraction represented by the number of pieces in the numerator and the denominator stays the same. You can use the words associated with each row to name the fraction in words.

Example 3

What fraction is represented by the strips shown? Name with a fraction and in words.

$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

What is the fraction?

The numerator is the number of pieces: 3

The denominator is the same as the denominator of each: 8

The fraction is: $\frac{3}{8}$

What is the fraction in words?

Look at the name by the row with $\frac{1}{8}$ going across on the fraction strips. It is "one-eighth".

This means that the way to name ONE piece in this row is "one-eighth".

To name 3 pieces in that row we would change the one to three and keep the word "eighths".

The name in words: three-eighths

Now It's Your Turn

Tell how each fraction should be read.

a. $\frac{3}{12}$

b. $\frac{2}{5}$

c. $\frac{4}{8}$

d. $\frac{1}{7}$

e. $\frac{3}{4}$

Solutions

a. three-twelfths

b. two-fifths

c. four-eighths

d. one-seventh

e. three-fourths

Comparing Fractions

Modelling fractions with pictures is a good way to compare fractions with the same denominator.

Example 4

Compare using <, >, =. $\frac{2}{5}$ _____ $\frac{1}{5}$

Model both fractions:

Compare the regions. You can see that there are more parts shaded for $\frac{2}{5}$ than $\frac{1}{5}$. Therefore $\frac{2}{5}$ is greater than $\frac{1}{5}$.

$\frac{2}{5} > \frac{1}{5}$

Example 5

Compare $\frac{2}{6}$ _____ $\frac{1}{3}$

Make a model of each and compare the shaded area.

Compare the regions. Notice that the same amount is shaded in each model; therefore, $\frac{2}{6}$ is equal to $\frac{1}{3}$.

The answer is: $\frac{2}{6} = \frac{1}{3}$

Now It's Your Turn

Use the circle given to answer the following on your own paper:

1. Write a fraction for the picture.
   Hint: What fraction of the circle is shaded?

2. Write a fraction for each of the following:

a. b. c.

3. Which of the picture models in number 2 is equivalent to the circle from number 1?

4. Complete using your answer from number 3: _____ is equivalent to _____.

Solutions

1. $\frac{6}{8}$

2a. $\frac{2}{3}$ 2b. $\frac{3}{4}$ 2c. $\frac{1}{2}$

3. b

4. $\frac{6}{8}$ is equivalent to $\frac{3}{4}$.

Comparing Fractions with Different Denominators

When comparing fractions with different denominators you can use fraction strips.

$\frac{1}{4}$		$\frac{1}{4}$	
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

Notice $\frac{2}{8} = \frac{1}{4}$. You can tell because the length of two-eighths is the same as the length of one-fourth.

$\frac{1}{4}$		$\frac{1}{4}$	
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$

Also, $\frac{4}{8} = \frac{2}{4}$.

There is a set of fraction strips at the back of the Unit in your Workbook. You can cut these out to work with while comparing fractions. Keep your fraction strips because you will use them again.

Let's explore! Use the fraction strips on your desktop while you read the examples that follow.

Example 6

Complete with <, >, or =: $\frac{2}{9}$ _____ $\frac{1}{5}$

Using fraction strips, compare the length of $\frac{2}{9}$ and $\frac{1}{5}$:

$\frac{1}{5}$	
$\frac{1}{9}$	$\frac{1}{9}$

Notice that $\frac{2}{9}$ is longer than $\frac{1}{5}$. You should be able to tell that $\frac{2}{9}$ is greater than $\frac{1}{5}$ by the length of the models.

$\frac{2}{9} > \frac{1}{5}$

Let's Explore

Exploration 3: Comparing Fractions

Materials: Unit 1, Lesson 5, Exploration 3 page in your Workbook, Fraction strips

Compare using <, >, or =:

$\frac{1}{5}$ _____ $\frac{1}{2}$ $\frac{2}{6}$ _____ $\frac{4}{10}$ $\frac{3}{8}$ _____ $\frac{4}{12}$

Use fraction strips to model each fraction.

Reflection

How do the fraction strips help you to identify larger fractions?

Use fraction strips to model each fraction.

$\frac{3}{4}$, $\frac{4}{6}$, $\frac{1}{3}$, $\frac{5}{8}$, $\frac{5}{12}$

Put the fractions in order from smallest to largest.

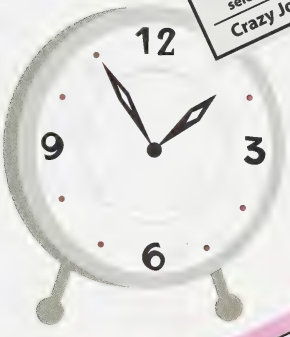
Reflection

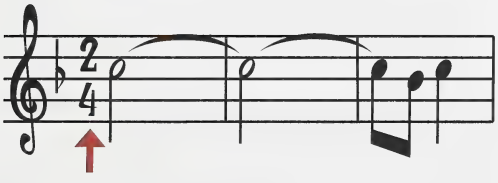
How did you use the fraction strips to put the fractions in order?

Where Are Fractions Used?

Fractions are everywhere. If you look in a newspaper you'll see advertisements for sales. You will see phrases such as ¼ off.

- Fractions are in recipes.
- Fractions are in Music
- Fractions are in Time
- Half hour ½ Quarter hour ¼





Problem Solving

Even without pictures and concrete models you can write fractions for a situation. You may need to model the numbers in word problems. Make a picture or use concrete models such as counters.

Example 8

Zach has eight soccer balls and seven basketballs in his storage room. What fraction of Zach's balls are soccer balls?

What are you looking for?

A fraction to describe the number of soccer balls.

What do you need?

We need the numerator and the denominator.

The numerator will be the number of soccer balls

The denominator will be the total number of balls.

Draw a picture or create a model.

Here is a model you could use. The blue counters are soccer balls and the white counters are basketballs.

Write the fraction:

$$\frac{\text{Number of Soccer Balls}}{\text{Total Number}} \longrightarrow \frac{8}{15}$$

$\frac{8}{15}$ of Zach's balls are soccer balls.

Example 9

Lian has four-sixths of a pizza. Write a fraction for the amount of pizza that Lian has.

Use fraction strips to model:

$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$

Name the fraction:

There are FOUR pieces so that is the first word. The denominator of each is 6 so the second word is sixths.

Four-sixths is $\frac{4}{6}$

Reflection

Alyssa has a tablecloth that the kids will use for a picnic. She says that one-fourth of the tablecloth is orange. What is wrong with her statement? Why?

Let's Practice

- In your Workbook go to Unit 1, Lesson 5 and complete 14 to 30.

Lesson 6

Understanding Decimals

The Value of Money

Pennies, dimes, and dollar coins all have different values. The dollar is the same as 100 pennies. Ten dimes is the same as a dollar. Ten pennies is the same as a dime.

Cameron has the following in his pocket:

Money is written in decimal form. You place the decimal after the number of dollars.

			
1	.	4	2

So the dollar amount is written $1.42.

Reflection

What is the relationship between finding the value of coins and writing decimals?

Objectives for this Lesson

In this lesson you will explore the following concept:

- Describe and represent decimals (tenths and hundredths) using models, pictures and symbols.

Concrete Models

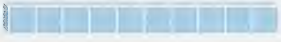
A **decimal** is a number with one or more digits to the right of the decimal point. To study decimals you can add two places to the place value table. Look at the value of each place.

Place	Hundreds	Tens	Ones	.	Tenths	Hundreds
Value	100	10	1		0.1	0.01

A good way to represent decimals is to use base ten blocks.

One square or flat is one or 1:

One-tenth or 0.1 is modeled with a "long".



One-hundredth or 0.01 is modeled with a unit cube.

Exploration 1: Making Decimal Models

Materials: Unit 1, Lesson 6, Exploration 1 page in your Workbook, Base 10 Blocks, OR Base 10 Models in your Workbook

1. Model each of the following:

   a. 3.05 b. 2.53 c. 1.48

2. Gather the following: 4 flats, 3 longs and 7 unit cubes. What is the decimal for this model?

3. Create your own model. Describe the model and write the decimal for the value it represents.

Go online to complete the Concept Capsule: Understanding Decimals Using Base 10 Blocks.

Picture Models

Values to the right of a decimal point are part of one whole. You can use pictures to represent the value of a decimal.

Example 1

Write a decimal for the given model.

The model is in 10 equal pieces. This means that the number of shaded pieces will be the digit that goes in the tenths place.

Use the place value table to place the digit. There are 6 shaded pieces so the digit will be 6.

Ones	.	Tenths	Hundredths
	.	6	

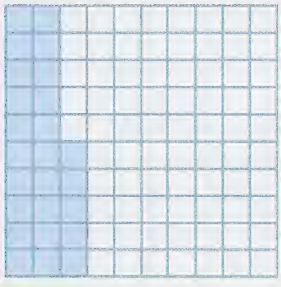
The decimal for the model is: 0.6

You need to look at the last digit after the decimal. In this case that is 6. Notice that it is in the tenths place. This tells you how to read it in words.

So the decimal in words is six tenths.

Example 2

Write the decimal represented by the model.



This model has 100 equal parts. This means that the last digit in the decimal will be placed in the hundredths place.

You can count to find that 25 of the 100 parts are shaded. The last digit of 25, or 5, will go in the hundredths place. The 2 will go in the tenths place.

Ones	.	Tenths	Hundredths
	.	2	5

The decimal is: 0.25

Decimals on the Number Line

A number line divided into ten equal parts can be used to model decimals.

Example 3

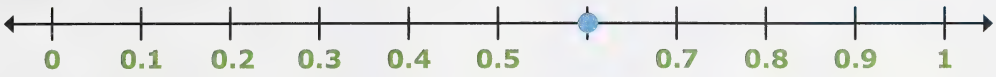
What is the value of the point shown on the number line?

Name the value that is represented by the blue dot: 0.3

Remember, the marks on the number line are equally spaced. This means that each mark is in order.

Example 4

What is the value of the point shown on the number line?



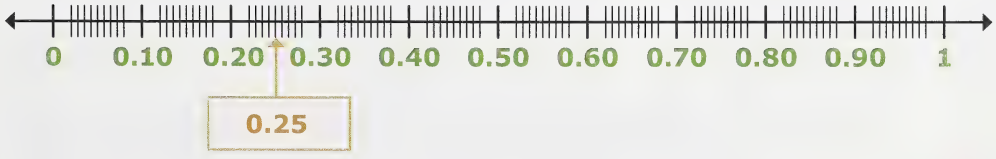
The number to the left of the blue dot is 0.5. The number to the right is 0.7. The point shown must be 0.6 since the marks are equally spaced.

A number line may also be divided into 100 equal parts. This lets you show the same amount in tenths or hundredths. Each line represents a decimal number. The tenths are marked, but the small lines between each tenths mark hundredths places.

Example 5

What is the value of the point shown?

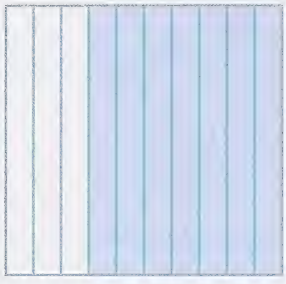
You need to count the small marks after 0.20 until you get to the small blue dot. Count like this: 0.21, 0.22, 0.23, 0.24, 0.25.

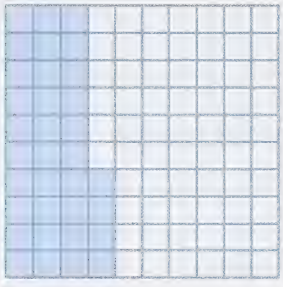


The amount is 0.25

Now It's Your Turn

Write the decimal shown by the model or number line.

a. 

b. 

c.

d.

Solutions

a. 0.7

b. 0.34

c. 0.8

d. 0.05

Let's Explore

Exploration 2: Money and Decimals

Materials: Unit 1, Lesson 6, Exploration 2 page in your Workbook, at least 10 pennies and 10 dimes, at least 5 Loonies

Make the following amounts using pennies, dimes, and Loonies.

1. $4.55 2. $2.34 3. $1.82 4. $3.51

Write the decimal for the value of each combination.

5. 3 Loonies, 7 dimes, 8 pennies

6. 1 Loonie, 4 dimes, 5 pennies

7. 5 Loonies, 3 dimes, 9 pennies

Writing Decimals

Given the name of a decimal in words, you need to be able to write it in decimal form.

Example 6

Write eight tenths in decimal form.

Put the eight in the tenths place since this is the name of the decimal:

Ones	.	Tenths	Hundredths
	.	8	

Write the decimal: 0.8

Notice that there is one zero in the ones place and there is only one digit to the right of the decimal. There is no need to put a number in the hundredths place since the name of our decimal does not have hundredths in it.

Example 7

Lian says that she has sixty hundredths of a dollar. Write sixty hundredths in decimal form.

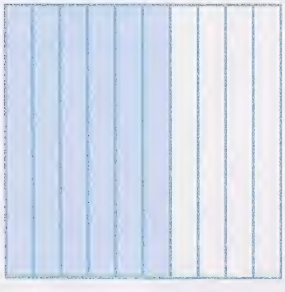
Write the number in the place value table. The number 60 will have its last digit in the hundredths place.

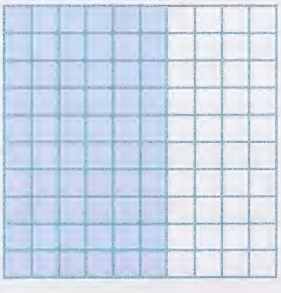
Ones	.	Tenths	Hundredths
	.	6	0

This means the 6 will be in the tenths place.

Since this is zero, does it matter if you put a 0 there?

Look at the model of 0.6 and 0.60:





In this case it does not matter if there is a 0 at the end.

Tens	Ones	.	Tenths	Hundreths
	0	.	6	0

The answer is: 0.60 OR 0.6

Example 8

Cameron says that he has six hundredths of a dollar. Write the amount in decimal form.

Write the number in the place value table. Since it is six hundredths the six will go in the hundredths place.

Ones	.	Tenths	Hundredths
	.		6

This means that there is an empty space between the decimal and the digit. You need to put a 0 there as a place holder.

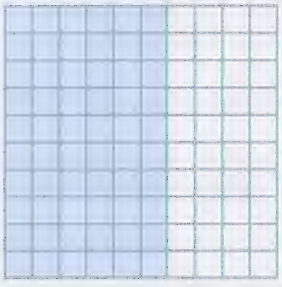
Ones	.	Tenths	Hundredths
	.	0	6

The answer is: 0.06

Notice the value of the tenths place in the answer. Since this is zero, does it matter if you put a 0 there?

In this case it does! Without placing a zero here your 6 would take on a different meaning. Without a 0 there you may write 0.6 which is equivalent to 0.60 or sixty hundredths.

0.6



0.06

The 0.6 figure has a very different value than the figure for 0.06.

Reflection

Why is 0.6 equal to 0.60?

Example 9

Write 0.12 in words.

What is the place the last digit is in?

Ones	.	Tenths	Hundredths
	.	1	2

The number part will be written as twelve.

The decimal part will be written as hundredths since the last digit is in the hundredths place.

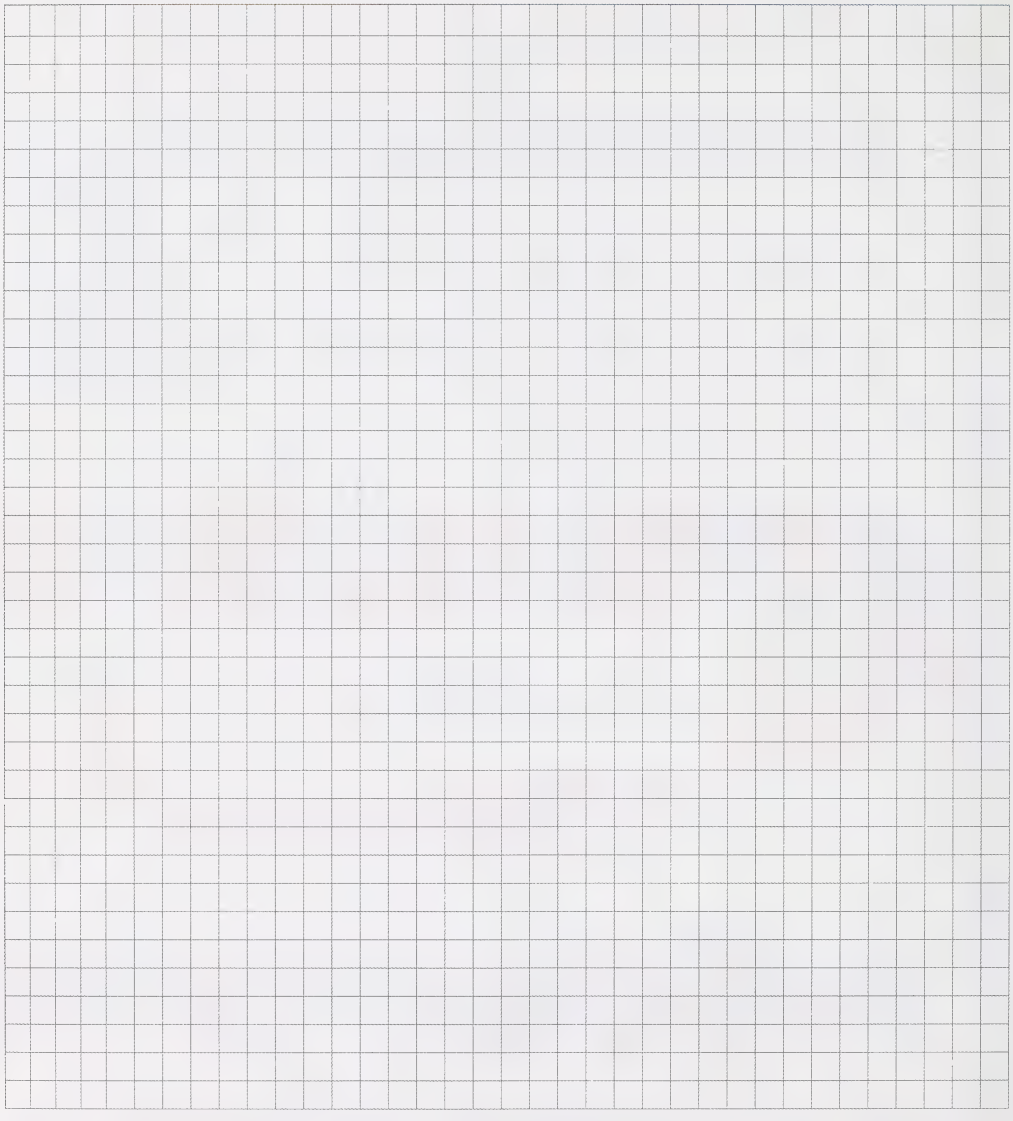
0.12 is twelve hundredths

Reflection

How is reading numbers in decimal form like writing them in decimal form?

Let's Practice

- In your Workbook go to Unit 1, Lesson 6 and complete 1 to 19.



Lesson 7

Decimal Fraction Relationships

Money Matters

Nina says that a dollar is 100 cents. Nina has 100 pennies so she has 1 dollar.

Cameron says that he has $\frac{1}{2}$ of a dollar.

Zach says that he has $0.50.

How can they both be right? You can use fractions or decimals to express parts of a dollar. The fraction $\frac{1}{2}$ and the decimal 0.50 are equal in value.

Reflection

What fraction of a dollar is 20 pennies? How do you write 20 cents in decimal form? How are the fraction and the decimal related?

Objectives for this Lesson

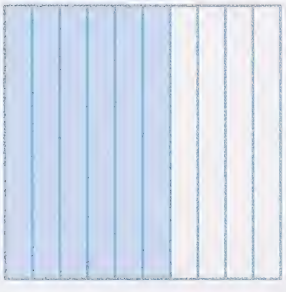
In this lesson you will explore the following concept:

- Relate decimals to fractions (to hundredths)

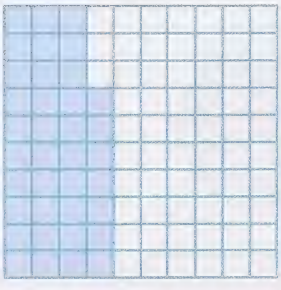
Relate Fractions to Decimals

Fractions and decimals have the same purpose. Both relate parts to a whole.

Decimals always have a whole that is cut into 10, 100, 1000, and more. This is how they relate to the base 10 system.



0.6



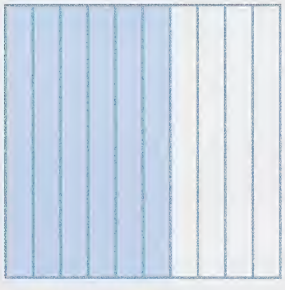
0.37

Fractions may have any number of parts.

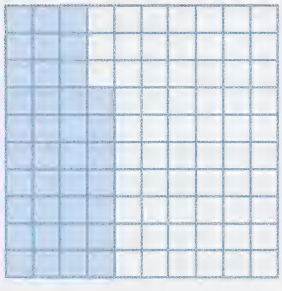
$\frac{3}{5}$

$\frac{1}{3}$

If you think of the models for decimals as a whole, the part that is shaded can also be a fraction.



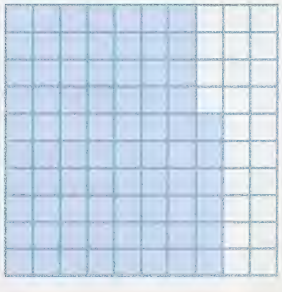
$\frac{6}{10}$



$\frac{37}{100}$

Example 1

Nina has shaded the squares in this 10 x 10 grid to represent a number she is thinking of.



a. What decimal amount is shaded?

The decimal is written using the method we learned in Lesson 6:

There are 100 parts and 76 are shaded.

The last digit of 76 is placed in the hundredths place so the 7 is in the tenths place.

This picture represents: 0.76

b. What fractional amount is shaded?

The fraction is written using the method we learned in Lesson 5.

There are 100 parts and 76 are shaded.

The number shaded will be the numerator and the number of parts will be the denominator.

This picture represents: $\frac{76}{100}$

Example 2

Daksha has shaded the rectangles of this square to represent a number he is thinking of.

a. What decimal amount is shaded?

There are 10 parts and 6 of them are shaded. The last digit is 6 and will be placed in the tenths place.

The picture represents: 0.6

b. What fractional amount is shaded?

There are 10 parts and 6 of them are shaded. The number shaded will be the numerator and the number of parts will be the denominator.

The picture represents: $\frac{6}{10}$

Let's Explore

Exploration 1: Decimal and Fraction Patterns

Materials: Unit 1, Lesson 7, Exploration 1 page from the Workbook, Pencil

Observe the table of equivalent fractions and decimals:

Fraction	$\frac{3}{10}$	$\frac{6}{10}$	$\frac{7}{10}$	$\frac{9}{10}$	$\frac{4}{100}$	$\frac{23}{100}$	$\frac{30}{100}$	$\frac{68}{100}$
Decimal	0.3	0.6	0.7	0.9	0.04	0.23	0.30	0.68

1. If the fraction's denominator is 10, how many decimal places are there?
2. If the fraction's denominator is 100, how many decimal places are there?
3. Draw a model for $\frac{3}{10}$ AND 0.3.
4. What decimal would be equivalent to $\frac{4}{10}$?
5. What fraction would be equivalent to 0.5?
6. Create a picture model that represents 0.5.
7. Reflect: What do a fraction and a decimal have in common?

Writing Decimals as Fractions

In a decimal, the place-value of the last digit tells you the denominator of the fraction.

If the last digit is in the tenths place then the denominator is 10.

$0.4 \longrightarrow \frac{4}{10}$

Tenths

If the last digit is in the hundredths place, then the denominator is 100.

$0.26 \longrightarrow \frac{26}{100}$

Hundredths

Example 3

Write the fraction for the decimal in the place value table.

Ones	.	Tenths	Hundredths
0	.	1	

What is the denominator?

The last digit, 1, is in the tenths place so the denominator is 10.

What is the numerator?

In this case the only number is 1, so that is the numerator.

Now you can write the fraction: $\frac{1}{10}$.

Example 4

Write the fraction for the decimal in the place value table.

Ones	.	Tenths	Hundredths
0	.	2	7

What is the denominator?

Since the last digit, 7, is in the hundredths place, the denominator is 100.

What is the numerator?

In this case the number is 27, so that is the numerator.

Now you can write the fraction: $\frac{27}{100}$

$0.27 = \frac{27}{100}$

Example 5

Zach has 2 cents. He wants to know what fraction of a dollar he has.

2 cents is \$0.02. Write the fraction for the decimal.

What is the denominator?

Since the last digit, 2, is in the hundredths place, the denominator will be 100.

What is the numerator?

The numerator will be the 2. You will not use the 0 in the numerator because 2 is standard form for 02.

Write the fraction: $\frac{2}{100}$

Zach has \$0.02 and that is $\frac{2}{100}$ of a dollar.

Now, try to name the fraction for each decimal.

Now It's Your Turn

Write each decimal as a fraction.

a. 0.2

b. 0.5

c. 0.23

d. 0.06

Solutions

a. $\frac{2}{10}$

b. $\frac{5}{10}$

c. $\frac{23}{100}$

d. $\frac{6}{100}$

Let's Practice

- In your Workbook go to Unit 1, Lesson 7 and complete 1 to 15.

Writing Fractions as Decimals

To write a fraction as a decimal, the denominator determines the place value.

If the denominator is 10, then the last digit will be in the tenths place.

$\frac{4}{10} \longrightarrow 0.4$

Tenths

If the denominator is 100, then the last digit needs to be in the hundredths place.

Example 6

Nina says that she has $\frac{4}{100}$ of a dollar. How much is that?

Write the fraction $\frac{4}{100}$ as a decimal.

What does the denominator mean?

In $\frac{4}{100}$ the denominator 100 tells you the hundredths place is where the numerator will end:

Ones	.	Tenths	Hundredths
	.		4

What goes in the tenths and ones places?

The tenths place must be filled with a zero since there are no tenths.

Ones	.	Tenths	Hundredths
0	.	0	4

$\frac{4}{100}$ is equal to 0.04

Example 8

Write $\frac{3}{10}$ as a decimal.

The denominator is 10. This means that the last digit of the numerator will be in the tenths place:

Ones	.	Tenths	Hundredths
	.	3	

$\frac{3}{10}$ is equal to 0.3

Example 7

Zach has $\frac{78}{100}$ of a dollar. Write $\frac{78}{100}$ as a decimal.

What is the place value of the last digit?

In $\frac{78}{100}$ the denominator is 100. The last digit of the numerator is 8. 8 has to be in the hundredths place.

Ones	.	Tenths	Hundredths
	.	7	8

Write the decimal: 0.78

Now It's Your Turn

Write each decimal as a fraction.

a. 0.09

b. 0.79

c. 0.12

Write each fraction as a decimal.

d. $\frac{2}{10}$

e. $\frac{3}{100}$

f. $\frac{15}{100}$

Solutions

a. $\frac{9}{100}$

b. $\frac{79}{100}$

c. $\frac{12}{100}$

d. 0.2

e. 0.03

f. 0.15

Go online to watch the Notepad Tutor: Relating Decimals to Fractions (to hundredths).

Let's Practice

- In your Workbook go to Unit 1, Lesson 7 and complete 16 to 26.

Math 4 Unit 1

Lesson 8

Addition

Public Transportation

Everyday, people choose to use a variety of different kinds of transportation other than cars. Airplanes, busses and trains are three of the major types of public transportation. You can see them in most places of the world.

Each type of transportation charges a fee for anyone who rides on it. It is important to keep an accurate record of how many people ride each day. Companies may decide to buy more busses if the busses are always full. Here are the records for one town's types of daily transportation:

Transportation	Number of Riders
Airplane	690
Bus	1 250
Train	475

Reflection

How would you find the total number of riders for all three forms of transportation?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Add 3- and 4-digit numbers
- Use place value for adding
- Estimate sums using front-end estimation or compatible numbers
- Solve problems involving addition

Go online to watch the Notepad Tutor: Addition Including Carrying.

Adding 3- and 4-Digit Numbers

Expanded notation and place value are very helpful tools in adding large numbers. You can put one of these concepts and your basic addition facts together. This will help you to add large numbers.

Adding using expanded notation:

Remember that we can break down numbers into expanded notation like this:

243

200 | 40 | 3

This shows that 243 = 200 + 40 + 3.

354

300 | 50 | 4

This shows that 354 = 300 + 50 + 4

When we add two 3-digit numbers, put the hundreds together, the tens together and the ones together:

200 | 40 | 3

300 | 50 | 4

Then add the parts:

500 | 90 | 7

Now we are ready for addition.

Example 1

Nina likes to add using expanded notation. This is how she found the answer to 243 + 321.

1: Write each number in expanded form:

243 = 200 + 40 + 3

321 = 300 + 20 + 1

2: Line up the numbers by place value:

200 + 40 + 3

+ 300 + 20 + 1

3: Add starting from the right: ones, then tens, then hundreds:

200 + 40 + 3

+ 300 + 20 + 1

500 + 60 + 4

4: Write the number in standard form:

243 + 321 = 564

You may also want to add using a place value chart.

Example 2

Cameron likes to add using column addition.

5 734 + 162

1: Line up the digits using place values in columns:

	Thousands	Hundreds	Tens	Ones
	5	7	3	4
+		1	6	2

is also

$$\begin{array}{r} 5\,734 \\ +\ \ 162 \\ \hline \end{array}$$

2: Add each column starting with the ones digits and move left to the thousands digits:

Add the ones	Add the tens	Add the hundreds	Add the thousands
5 734	5 734	5 734	5 734
+ 162	+ 162	+ 162	+ 162
6	96	896	5 896

Since there are no thousands in the second number it is like adding 5 + 0 in that column.

5 734 + 162 = 5 896

Example 3

Add using column addition.

2 367 + 4 131

1: Line up the digits based on place value.

	Thousands	Hundreds	Tens	Ones
	2	3	6	7
+	4	1	3	1

is also

$$\begin{array}{r} 2\ 367 \\ +\ 4\ 131 \\ \hline \end{array}$$

2: Add each column starting with the ones.

Add the ones	Add the tens	Add the hundreds	Add the thousands
2 367	2 367	2 367	2 367
+ 4 131	+ 4 131	+ 4 131	+ 4 131
8	98	498	6 498

2 367 + 4 131 = 6 498

Now try some of these on your own before moving to the next section.

Now It's Your Turn

Add using place value.

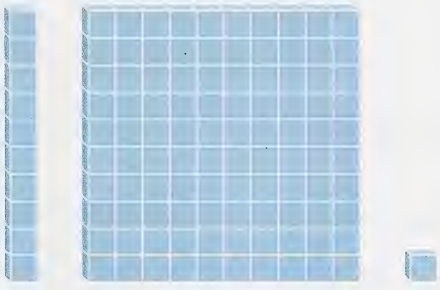
a. $\begin{array}{r} 482 \\ +\ 317 \\ \hline \end{array}$ b. $\begin{array}{r} 225 \\ +\ 742 \\ \hline \end{array}$ c. 982 + 210 d. 1 608 + 2 371

Solutions

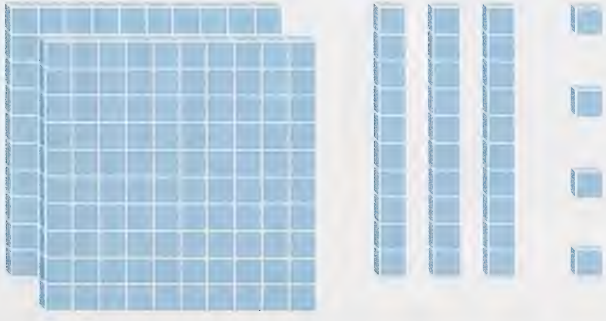
a. 799 b. 967 c. 1 192 d. 3 979

Addition with Regrouping

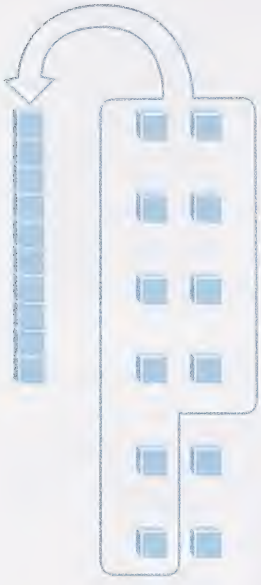
One way to add is using base 10 blocks. For the next few examples, use your base ten blocks on your desktop as you follow along.



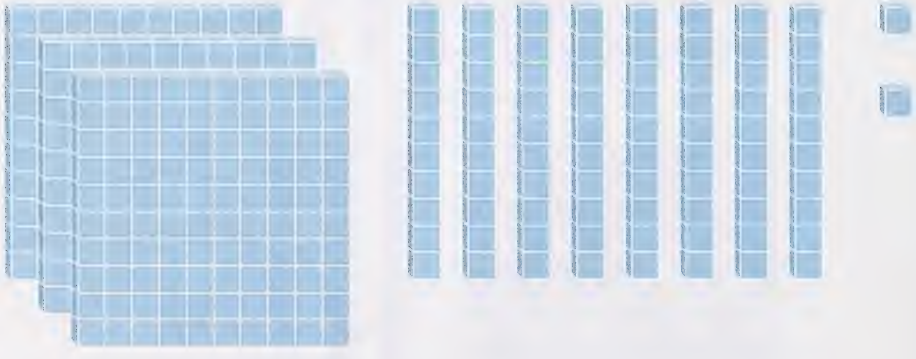
Gather base 10 blocks for 148 + 234



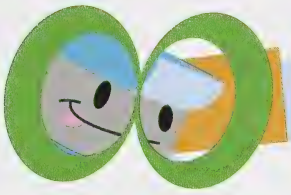
You want to combine these starting with the ones. There are 12 ones. You can make one long out of 10 of the ones:



Now you have the following:



This means that you have regrouped the ones to become a ten. This works the same way when you are adding with other methods.



Let's Explore

Exploration 1: Regrouping

Materials: Unit 1, Lesson 8, Exploration 1 page from your Workbook, Hundred Squares from the end of the Unit in your Workbook, Scissors, Pencil

Use the scissors to cut out the Hundred Squares.

1. Create a model for 421 and 293.
2. Use the models to add 421 + 293. What is the sum?
3. What value(s) had to be regrouped when you added 421 + 293?
4. Create your own model of two 3-digit numbers.
5. Use the models to add. What is your addition problem and the sum?
6. What value(s) had to be regrouped when you added your numbers together?

Sometimes the numbers in a certain place value will require you to regroup. You will add to the next place value. Here are three ways of adding with regrouping.

Example 4

Add with regrouping using expanded notation.

$$\begin{array}{r} 8\,239 \\ +\ 1\,346 \\ \hline \end{array}$$

1: Line up the numbers to do addition in expanded form:

$$\begin{array}{r} 8\,000 + 200 + 30 + 9 \\ +\ 1\,000 + 300 + 40 + 6 \\ \hline \end{array}$$

2: Add from the ones to the thousands:

$$\begin{array}{r} 8\,000 + 200 + 30 + 9 \\ +\ 1\,000 + 300 + 40 + 6 \\ \hline 9\,000 + 500 + 70 + 15 \end{array}$$

Notice that the ones digit added up to a two-digit number. This is when you know it is a regrouping problem. We have to do something a little different when this happens.

3: Regroup if required:

Look at the ones: since 15 is 10 + 5 you have to regroup. Now you have another 10. Add this to the 70 and it becomes 80.

$9\,000 + 500 + 70 + 15$

$9\,000 + 500 + 70 + 10 + 5$

OR

$9\,000 + 500 + 80 + 5$

This is called regrouping. You have created a new grouping of 10 from the ones.

$8\,239 + 1\,346 = 9\,585$

Remember, another way of adding large numbers is with a place value chart or using columns. Here is how you regroup using these methods.

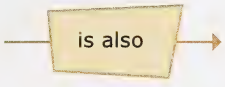
Example 5

Add with a regrouping space.

7 586 + 2 934

1: Line up the place values for addition

	Thousands	Hundreds	Tens	Ones
	7	5	8	5
+	2	8	3	4



$$\begin{array}{r} 7\,585 \\ +\ 2\,934 \\ \hline \end{array}$$

2: Add each column starting with the ones

$$\begin{array}{rrrr} 7 & 5 & 8 & 5 \\ +\ 2 & 9 & 3 & 4 \\ \hline 9 & 14 & 11 & 9 \end{array}$$

We cannot have two-digit numbers in these columns so we must regroup.

3: Add a line below the answer for the purpose of regroupings

$$\begin{array}{rrrr} 7 & 5 & 8 & 5 \\ +\ 2 & 9 & 3 & 4 \\ \hline 9 & 14 & 11 & 9 \\ \hline\hline \end{array}$$

4: For each double digit number add the tens digit to the next column:

Ones: Single Digit	Tens	Hundreds	Thousands: Single Digit
7 5 8 5 + 2 9 3 4 9 14 11 9	7 5 8 5 + 2 9 3 4 9 14 11 9 1	7 5 8 5 + 2 9 3 4 9 14 11 9 1 1	7 5 8 5 + 2 9 3 4 9 14 11 9 1 1

5: Add your original number and this new line to get your answer after regrouping.

```
  7  5  8  5
+ 2  9  3  4
  9 14 11  9
  1  1
 10  5  1  9
```

Since there are no tens or ones in the second number it is like adding 0 in those columns.

The answer is: 10 519

A third way of adding large numbers with regrouping is to carry. This is similar to the method you just did but without the extra line. Look at the following example to understand further.

Example 6

Add with Regrouping by Carrying.

```
  487
+ 945
```

1: Add the ones. 7 + 5 = 12. Put the ones digit for this answer (2) below the ones place and carry the 1 that represents 10. Write the 1 above the tens column.

$$\begin{array}{r} {\scriptstyle 1} \\ 487 \\ +\ 945 \\ \hline 2 \end{array}$$

2: Add the tens. Be sure to add the 1 that you carried before. 1 + 8 + 4 = 13. You will carry the 1 to the hundreds column and put the 3 below the tens.

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 487 \\ +\ 945 \\ \hline 32 \end{array}$$

3: Add the hundreds. 1 + 4 + 9 = 14

$$\begin{array}{r} {\scriptstyle 1\ 1} \\ 487 \\ +\ 945 \\ \hline 1\,432 \end{array}$$

487 + 945 = 1 432

Let's Practice

- In your Workbook go to Unit 1, Lesson 8 and complete 1 to 16.

Let's Explore

Exploration 2: Add 'em Up!

Materials: Unit 1, Lesson 8, Exploration 2 page from your Workbook, Paper, marker, 10 index cards

This Exploration activity is all about practicing your addition skills. You will randomly choose cards and add together the numbers on them. Let's see how high your sum can be!

1. Write each of these numbers on the index cards. Write only one number per card.

   856 4 371 924 546 3 214 650 5 682 3 810 1 094 865

2. Shuffle the number cards just like a regular deck of cards and place them in a stack face down.

3. Draw the top card and write it down on your paper. Draw the next card on the top of the stack and write it underneath the first number on your paper.

4. Add the two numbers together using column addition.

5. Repeat instructions 2 through 4 with the remaining cards. You should complete a total of 5 questions.

Answer the following questions:

1. If you could choose any two numbers out of the ten numbers on the cards, which two cards would give you the largest answer?

2. If you could choose any two numbers out of the ten numbers on the cards, which two cards would give you the smallest answer?

Estimating Sums

You should estimate sums to eliminate errors. Two estimating skills you should try are:

- front-end estimation
- compatible numbers

Front-end estimation is when you add only the largest place value digits.

456 + 328 = 400 + 300 = 700

The **compatible numbers** method is different. You find two numbers that are close to the original problem. Next you add those together to get your answer.

456 + 328 456 is close to 450 and 328 is close to 300:

450 + 300 = 750

Example 7

Estimate the sum using front-end estimation or compatible numbers. Show your work.

432 + 875

Front-end estimation:

1: Line up the place values for addition.

$$\begin{array}{r} 432 \\ +\ 875 \\ \hline \end{array}$$

2: Add the front digits and write zeros for the other digits

$$\begin{array}{r} 432 \\ +\ 875 \\ \hline 1\ 200 \end{array}$$

Front End Estimation **1 200**

432 + 875 is about 1 200

Compatible numbers:

1: Think of a basic fact that relates to the problem to help you find compatible numbers.

432 is close to 400

875 is close to 900

A basic fact related to the problem is 4 + 9 = 13

2: Add.

400 + 900 = 1 300

Compatible Numbers **1 300**

432 + 875 is about 1 300

432 + 875 = **1 307**

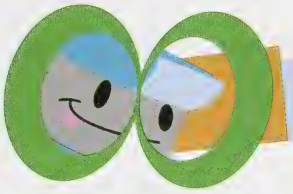
When you are adding, check to see if your answer is close to one of the estimates.

Cameron added 432 + 875 and his answer was 1 307.

Is his answer within an acceptable range?

The front-end estimate for Cameron's problem is 400 + 800 = 1 200.

Yes. His answer is 107 more than the front-end estimation solution.



Let's Explore

Exploration 3: Estimating Sums

Materials: Unit 1, Lesson 8, Exploration 3 page from your Workbook, Paper, Pencil

Use this problem to answer the following questions.

$$\begin{array}{r} 1\,495 \\ +\ 3\,968 \\ \hline \end{array}$$

1. What does the problem look like when front-end estimation is used?
2. Estimate the sum using front-end estimation.
3. How would you set up the problem for compatible numbers?
4. What is the solution to your problem for compatible numbers?
5. What is the actual sum?
6. Is this answer closer to the estimate for front-end estimation or compatible numbers?
7. Why do you think that is?

Let's Practice

- In your Workbook go to Unit 1, Lesson 8 and complete 17 to 25.

Solving Word Problems

Word problems involving addition will have certain clue words:

sum **combined** **altogether** **increased by** **more than** **total of**

When you see these words you know that you should add something. Next, you need to pick out the pieces of the problem to determine what you should be adding.

Example 8

Write a number sentence for this problem. Solve.

Daksha has 140 pennies in a jar. Alyssa has 480 pennies saved. How many pennies do they have altogether?

What are we looking for?

Total number of pennies Daksha and Alyssa have

What are the numbers we know?

Daksha has 140 and Alyssa has 480.

Write a number sentence and solve:

140 + 480

140 + 480 = 620

Look at the problem again and figure out what that answer represents.

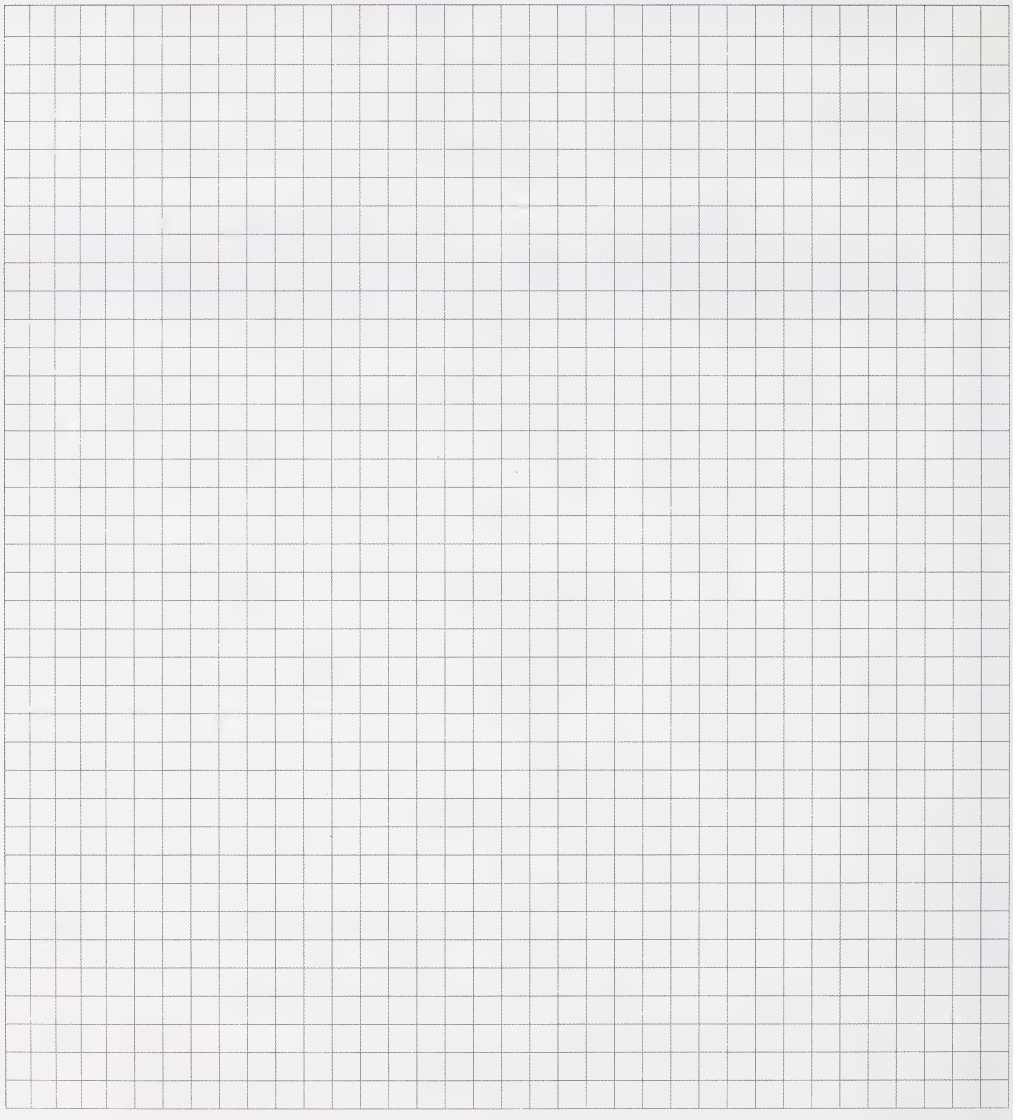
620 pennies

Always give your answer to a word problem in a complete sentence.

Daksha and Alyssa have 620 pennies altogether.

Let's Practice

- In your Workbook go to Unit 1, Lesson 8 and complete 26 to 29.



Math 4 Unit 1

Lesson 9

Decimal Addition

Practice Makes Perfect

Athletes in every sport must practice their skills in order to be the best. Practice like this takes great amounts of effort and dedication. Many track and field events are timed events. The first person to finish is the winner. Two of these events are the 100 metre dash and the 400 metre dash. One second really matters in these events.

1996 Summer Olympics 100 Metre Dash Results		
Gold Medal	Donovan Bailey (Canada)	9.84 seconds
Silver Medal	Frankie Fredericks (Namibia)	9.89 seconds
Bronze Medal	Alto Boldon (Trinidad & Tobago)	9.90 seconds

Can you believe how close the race was?

Reflection

How much faster was Donovan Bailey than Frankie Fredericks?

Some of the events are relay races. Four people take turns running equal distances. The times of each runner are added together to see how fast they finished the race. The Canadian relay team won a gold medal at the 1996 Olympics. The combined time of the four runners was 37.69 seconds.

Reflection

How would you find the relay time for you and three of your friends?

Objectives for this Lesson

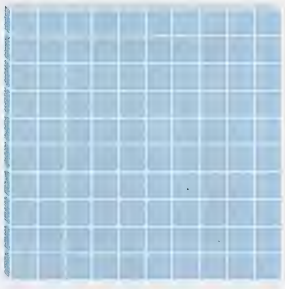
In this lesson you will explore the following concepts:

- Add decimals to hundredths
- Use compatible numbers to estimate sums
- Estimate sums to solve problems
- Use front-end estimation for adding

Adding Decimals Using Concrete Models

One method for adding decimals is using Base 10 Blocks.

You used them to represent large numbers in earlier lessons. When you use Base 10 Blocks for decimals, they have different values as seen here:



flat = 1

long = 0.1

small block = 0.01

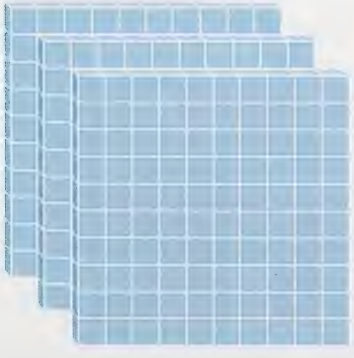
Example 1

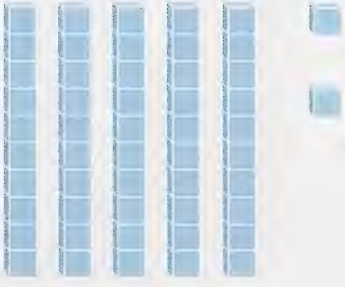
Add 3.52 + 1.46 using Base 10 Blocks.

Strategy 1: Using Base 10 Blocks

1: Model each number.

3.52: 3 ones, 5 tenths, 2 hundredths

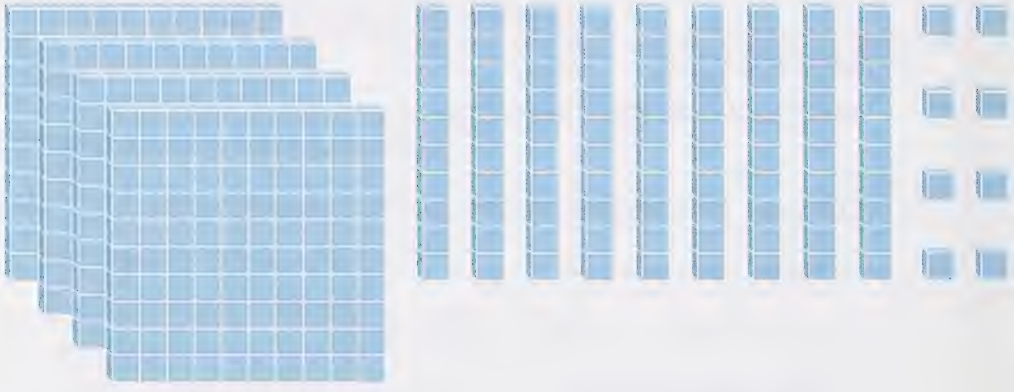




1.46: 1 ones, 4 tenths, 6 hundredths

2: Combine and count:

4 ones, 9 tenths, 8 hundredths



3.52 + 1.46 = 4.98

Strategy 2: Using Hundred Squares

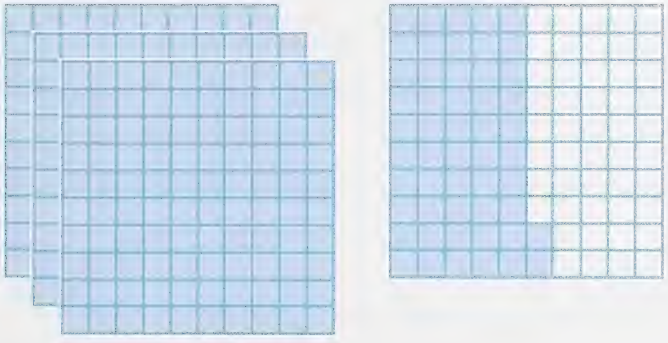
Another method for adding decimals is using Hundred Squares. There are Hundred Squares at the back of this Unit in your Workbook.

Here is the same problem answered using Hundred Squares:

1: Model the first number.

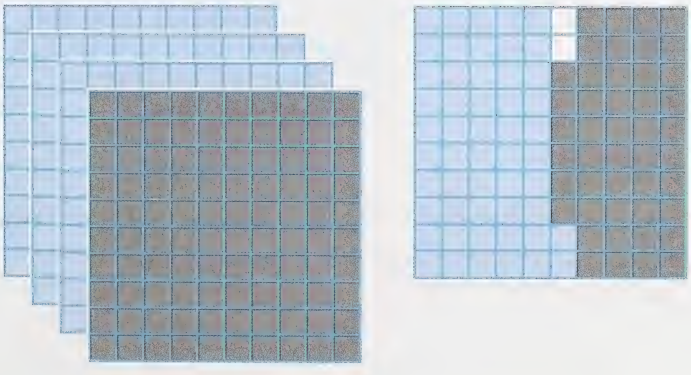
Shade 3 whole hundred squares to represent 3 ones. Now shade 52 parts of another hundred square to represent 0.52.

3.52



To model the 3.52 + 1.46 you need to add the 1.46 model. First add one whole hundred square to represent 1 and then take the Hundred Square where you shaded 0.52 and shade 0.46 more on that same square:

3.52 + 1.46



2: Count.

3.52 + 1.46 = 4.98

Adding Decimals by Lining up the Decimals

You need to add based on place value. The easiest way to do this is to always line up the decimal.

Example 2

Add 3.4 + 1.23

1: Line up the decimals.

$$\begin{array}{r} 3.4 \\ +\ 1.23 \\ \hline \end{array}$$

2: Add from right to left. Start with the smallest place value. Bring down the decimal where it is:

Hundredths	Tenths	Ones
3.4	3.4	3.4
+ 1.23	+ 1.23	+ 1.23
3	.63	4.63

3.4 + 1.23 = 4.63

That seems really easy, but don't be happy too soon! There are times when you will have to regroup. Just use a place value chart for regrouping and you will do fine!

Addition of Decimals with Regrouping

You can use concrete models to add decimals that require regrouping.

Use Base 10 Blocks or Hundred Squares to manipulate the regrouping of numbers.

Example 3

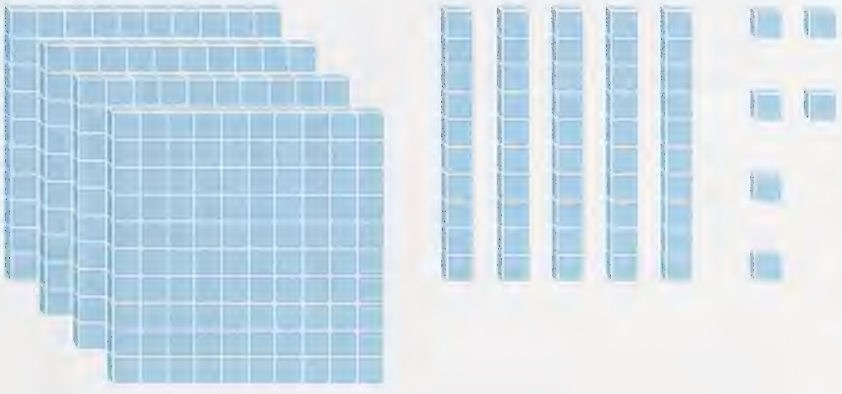
Add 4.56 + 3.78 using Base 10 Blocks.

Let's explore! Use Base 10 Blocks on your desk as you read this problem.

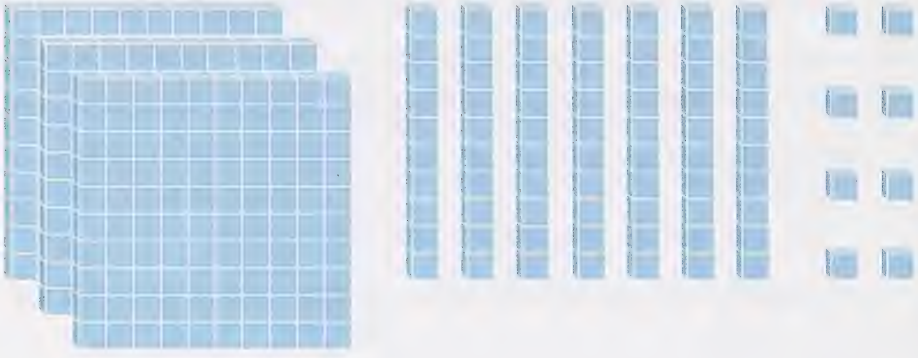
Strategy 1: Using Base 10 Blocks

1: Model each number:

4.56: 4 ones, 5 tenths, 6 hundredths



3.78: 3 ones, 7 tenths, 8 hundredths

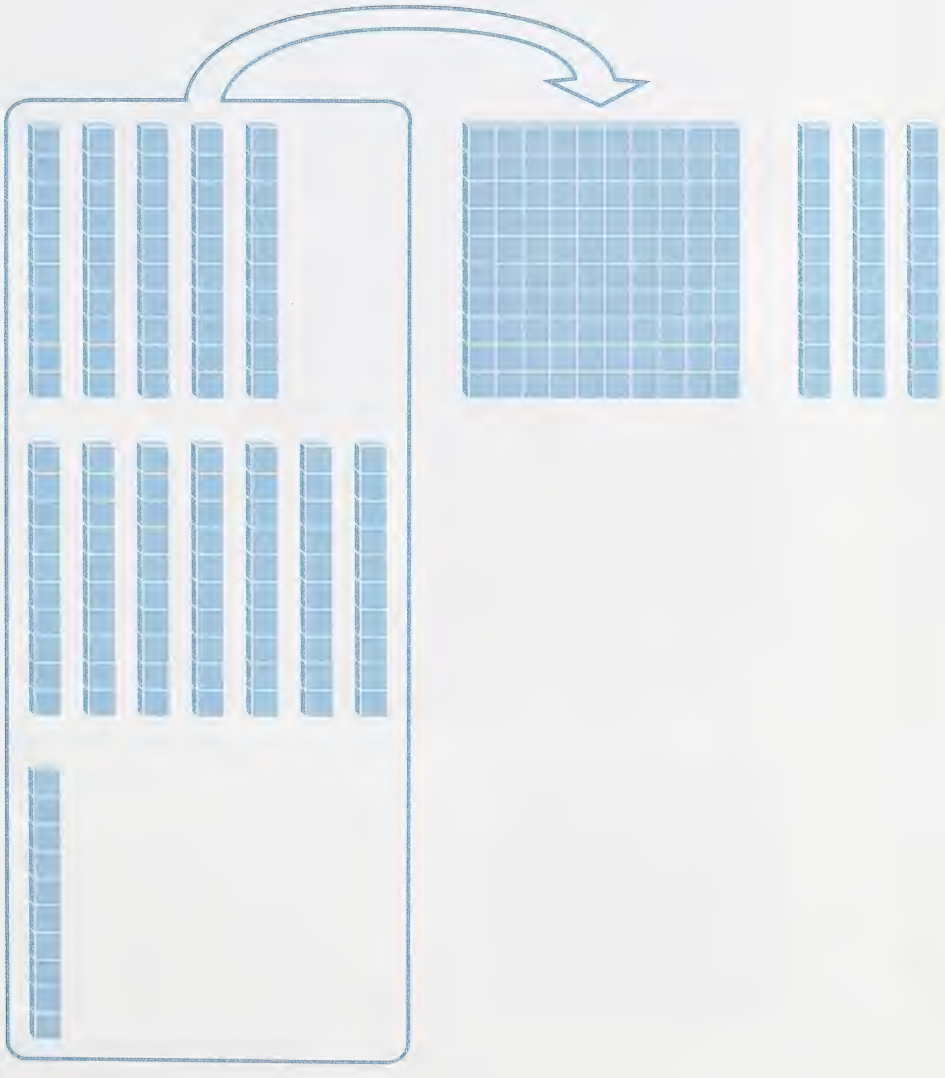


2: Regroup starting with the hundredths:

There are 6 hundredths plus 8 hundredths – that is 14 hundredths pieces. Ten of these will create another tenth or long with 4 hundredths remaining:

3: Regroup the tenths, remembering that you just created a new tenth.

There are now 5 tenths from 4.56. There are 7 tenths from 3.78. There is 1 tenth that was regrouped from the hundredths. This creates 13 tenths pieces. You can regroup 10 of these to form 1 ones. That leaves 3 tenths:

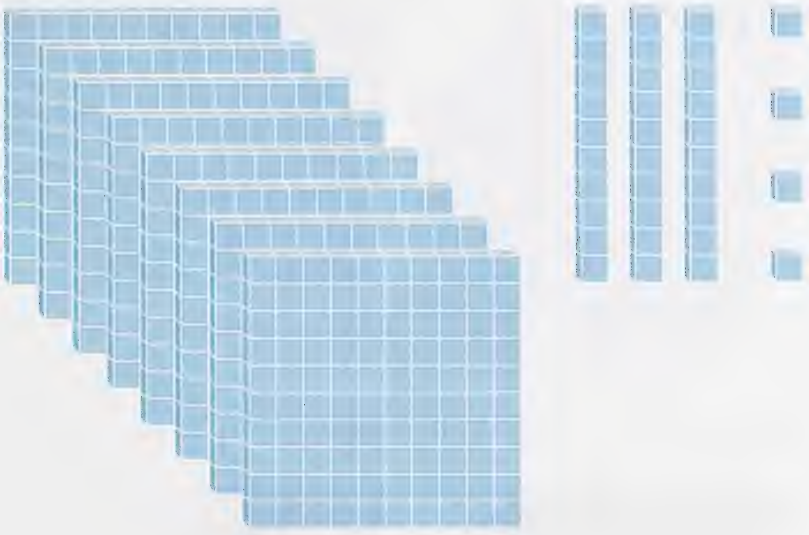


4: Add the ones, remembering that you just created another one:

There are now 4 ones from 4.56, 3 ones from 3.78 and 1 one from the last regrouping.

5: Count:

You have 8 ones, 3 tenths, 4 hundredths



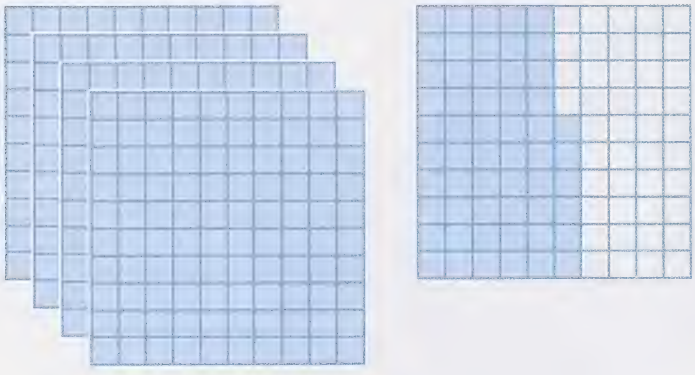
4.56 + 3.78 = 8.34

Strategy 2: Using Hundred Squares

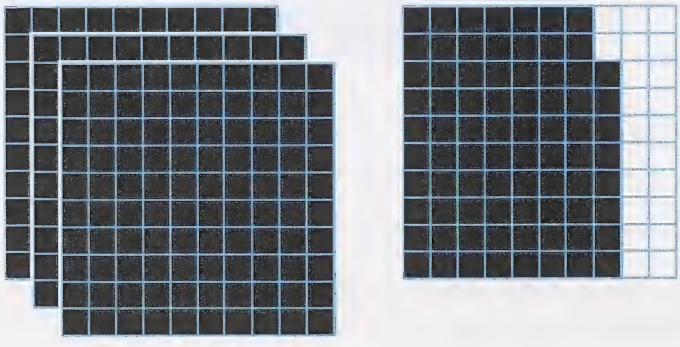
Let's explore! Here is the same problem using Hundred Squares. Use hundred squares from the back of this Unit in your Workbook to create the following models.

1: Model each number

4.56: 4 ones, 5 tenths, 6 hundredths



3.78: 3 ones, 7 tenths, 8 hundredths

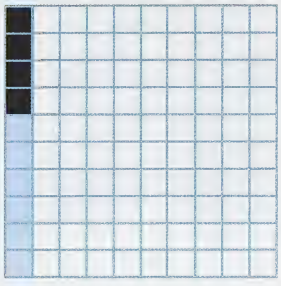


2: Regroup starting with the hundredths:

Take two new Hundred Squares. You will shade for tenths on one and hundredths on the other.

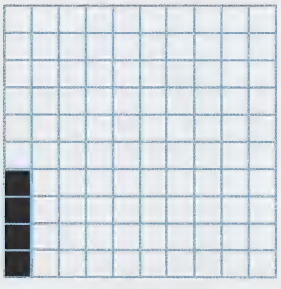
You need to shade 6 hundredths plus 8 hundredths.

On the first square shade 6 + 4 = 10 squares making a tenth.



tenths

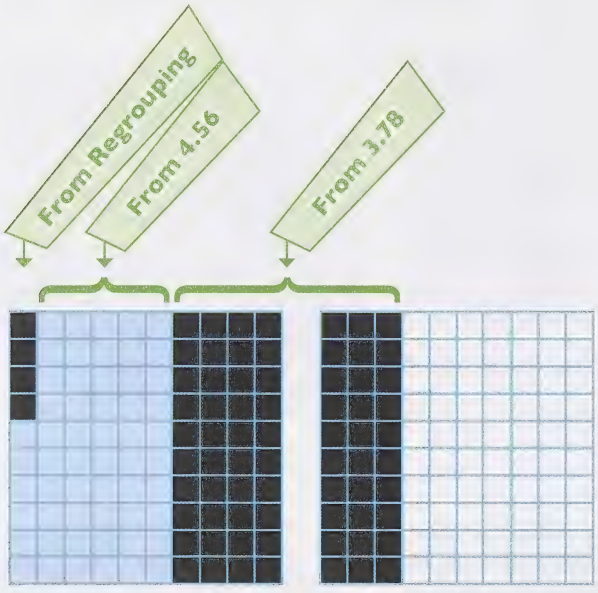
On the second square shade the remaining 4 squares.



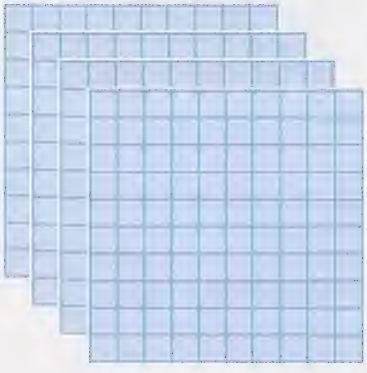
hundredths

3: Regroup the tenths, remembering that you just created a new tenth.

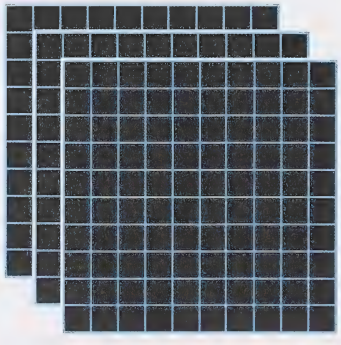
There are now 5 tenths from 4.56, 7 tenths from 3.78 and 1 tenth from the last step. Shade the rest as shown:



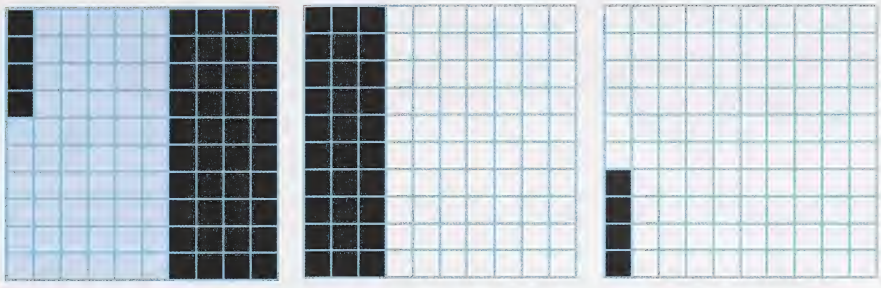
4: Add the ones, remembering that you created 1 when you regrouped the tenths. There are now 4 ones from 4.56, 3 ones from 3.78 and one from the last step. Keep the 3 tenths and 4 hundredths squares.



ones

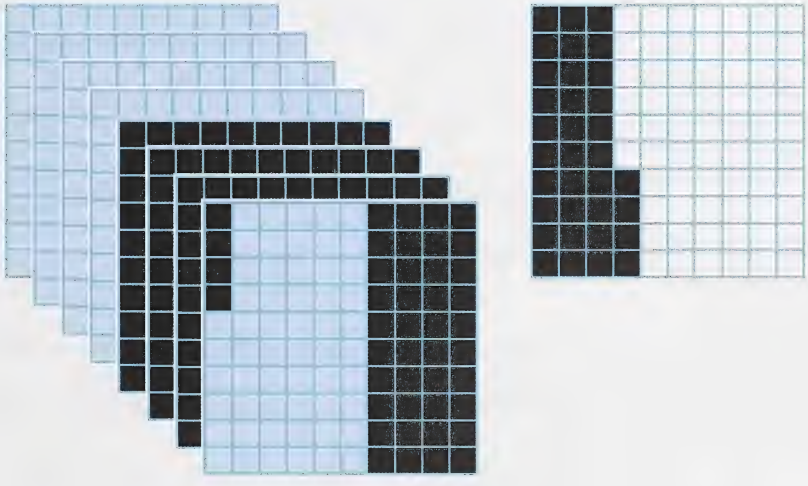


ones



ones tenths hundredths

5: Put it all together:



4.56 + 3.78 = 8.34

Let's Explore

Exploration 1: Adding Decimals

Materials: Unit 1, Lesson 9, Exploration 1 page from your Workbook, Hundred squares, Paper, Pencil

A triathlon is an event where athletes swim, bike and run. There are triathlons of different distances. Here are a few:

	Swim	Bike	Run
Olympic	1.5 km	40 km	10 km
Half Iron Man	1.9 km	90 km	21.09 km
Iron Man	3.8 km	180 km	42.2 km

Find the sum of the distances for each triathlon.

Adding Decimals Using Expanded Notation or Place Value

Place value using expanded notation may be used rather than regrouping. Simply work the problem in steps.

Example 4

Add 4.56 + 3.78 using Expanded Notation

1: Using expanded notation, add each pair of like values:

$$\begin{array}{r} 4 + .5 + .06 \\ +\ 3 + .7 + .08 \\ \hline 7 + 1.2 + .14 \end{array}$$

2: Add the three numbers together, making sure to line up the decimals:
If there is no decimal in a number, put it behind the number just like we have done with the number 7.

$$\begin{array}{r} 7. \\ 1.2 \\ +\ 0.14 \\ \hline 8.34 \end{array}$$

4.56 + 3.78 = 8.34

Example 5

Add 2.43 + 4.21

1: Line up using place value

Ones	.	Tenths	Hundredths
2	.	4	3
4	.	2	1

is also

$$\begin{array}{r} 2.43 \\ +\ 4.21 \\ \hline \end{array}$$

2: Add each column beginning with the least place value, in this case, hundredths to ones from right to left.

Hundredths	Tenths	Ones
2.43 + 4.21 4	2.43 + 4.21 .64	2.43 + 4.21 6.64

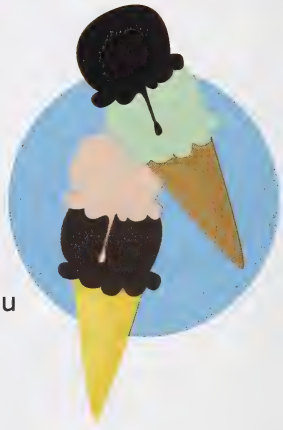
The answer is: 6.64

Go online to watch the Notepad Tutor: Adding Decimals (to hundredths).

Let's Practice

- In your Workbook go to Unit 1, Lesson 9 and complete 1 to 16.

Let's Explore



Exploration 2: One Scoop or Two?

Materials: Unit 1, Lesson 1, Exploration 2 page from your Workbook, Base 10 Blocks, Coloured pencils, Pencil

On Monday after school, you decide to treat your best friend to an ice cream cone at your local ice cream shop. When you arrive at the shop you look at the menu and decide what you want to order. Here is the menu:

Sugar Cones	
One Scoop	$1.50
Two Scoops	$2.25
Waffle Cones	
One Scoop	$2.25
Two Scoops	$3.00

Use the concept map provided on the Exploration page in your Workbook to help you with this.

1. Read the menu and decide what both you and your friend will order. List your order.
2. In the square labelled PROBLEM of the map write the two numbers as an addition problem.
3. Model the addition problem on your desktop using the Base 10 Blocks.
4. In the square labelled DRAW, draw a picture of each of the Base 10 Block models. You may use the flats, longs and single squares. Use your coloured pencils to shade the blocks.
5. In the square labelled STRATEGY, complete the addition problem by using the expanded notation strategy.
6. In the square labelled ANOTHER STRATEGY, complete the addition problem by lining up the decimals and adding.

Estimating Sums

Using place value you can estimate the sum of decimal addition problems. This helps you to check your answer. There are two methods we can use: Front-End Estimation and Compatible Numbers.

Front-End Estimation

When the sums are fairly complex it is sometimes easier to use front-end estimation. This is most commonly used with large values.

Example 6

Estimate the sum using front-end estimation: 14.65 + 82.87

1: Set up the addition

2: Front-end: round each **addend**. Remember, keep the first digit, and the rest become zeros. There is no need to write the zeros after the decimal place.

$$\begin{array}{r} 14.65 \\ +\ 82.87 \\ \hline \end{array} \longrightarrow \begin{array}{r} 10 \\ +\ 80 \\ \hline \end{array}$$

14.65 + 82.87 is about 90

Compatible Numbers

Compatible numbers are numbers that you may determine are easier to add than what the problem presents. When you use these just be sure you understand that your answer is an estimate.

Example 7

Answer parts **a** and **b** for the addition of 45.18 + 28.98

a. What are the compatible numbers we should use to add more quickly?

The compatible numbers are close to the ones you are adding. They should be numbers that you are more comfortable adding.

What are you more comfortable adding? 45.18 can be 40, 45, or 50.

You determine the number based on your own level of comfort. This example will use 45 since it is closest to the actual value.

For 28.98 we will use 30 since 28.98 is closer to 30 than 25.

The compatible numbers could be: 45 and 30

b. What is the approximate sum using the compatible numbers?

The approximate sum we will use:

45 + 30 = 75

Let's Practice

- In your Workbook go to Unit 1, Lesson 9 and complete 17 to 26.

Solving Problems by Estimation

Once you can add to the hundredths you are ready to work with money! That can be really fun. Impress your parents next time you go to the grocery store. Estimate the total bill.

With money, it is very easy to think in terms of quarters and dimes.

We know quarters have a value of 25 cents which looks like $0.25.

= $ 0.25

We know dimes have a value of 10 cents which looks like $0.10.

= $ 0.10

Money can make adding numbers easy. You can use .25 and .10 as compatible numbers. These are easy to add in your head!

Example 8

Daksha and Lian go to the grocery store. They purchase pop for $2.15 and ice cream for $4.32. About how much did they pay?

What are we looking for?

An estimated amount of how much they paid. You know this because the problem says "about how much".

What numbers do we know? How will we estimate?

We know $2.15 and $4.32

Since this is money, let's find compatible numbers.

For $2.15 let's use dimes or $2.10.

For $4.32 we will use quarters or $4.25.

Write a number sentence.

We know to add the values because the total cost will be a combination of the two values.

2.10 + 4.25

Line up the decimals and add.

$$\begin{array}{r} 2.10 \\ +\ 4.25 \\ \hline 6.35 \end{array}$$

State the estimate as a sentence:

Daksha and Lian will pay about $6.35.

Example 9

Cameron ran from the school to his house in 14.5 seconds. He then ran to Nina's house in 20.4 seconds. About how long did he run in total?

What are we looking for?

The approximate total amount of time Cameron ran.

What numbers do we know? How will we estimate?

We know 14.5 and 20.4. This time let's use front-end estimation:

14.4 becomes 10

20.4 becomes 20

Write a number sentence.

We will add the two running times to get the total time of his run. So:

10 + 20

Add

$$\begin{array}{r} 10 \\ +\ 20 \\ \hline 30 \end{array}$$

State the estimate as a sentence:

Cameron ran for about 30 seconds.

Let's Practice

- In your Workbook go to Unit 1, Lesson 9 and complete 27 to 30.

Math 4 Unit 1

Lesson 10

Subtraction

Are We There Yet?

A student's two favourite words: Summer Vacation!

Some schools give an extended vacation time in the summer. That allows people to have time to take a trip. There are so many interesting places to see in our world. Some places are close to home. Others are on the other side of the world.

Planning a vacation is a lot of fun. It is really important to get all of the facts about where you are going. You will need to know how far it is from your home. What will the weather be like? What types of things can you do when you get there?

A vacation to the other side of your country would be a long drive.

Cameron lives in Calgary, Alberta and is going to visit Niagara Falls. What a long trip! The drive will be 3 575 km. On the first day his family drives 800 km. How many kilometres do they have left?

Reflection

How would you find the number of kilometres left to travel? Can you subtract a 3-digit number from a 4-digit number?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Subtract 3- and 4-digit numbers.
- Use estimation to check answers.
- Solve problems involving subtraction.

Subtracting 3- and 4-Digit Numbers

Subtracting numbers is a little more tricky than adding. In subtraction you start from the right and subtract one set of digits at a time. Here is what it would look like if it was always easy.

Example 1

Subtract.

$$\begin{array}{r} 489 \\ -\ 253 \\ \hline \end{array}$$

1: Start by subtracting the ones digits

$$\begin{array}{r} 489 \\ -\ 253 \\ \hline 6 \end{array}$$

2: Next, the tens

$$\begin{array}{r} 489 \\ -\ 253 \\ \hline 36 \end{array}$$

3: Finally, the hundreds

$$\begin{array}{r} 489 \\ -\ 253 \\ \hline 236 \end{array}$$

489 – 253 = 236

Your subtraction facts to the 9s make this type of problem simple. Of course that means you are probably ready for more!

In addition you learned to regroup numbers. For subtraction you will have to borrow.

Subtract by Borrowing

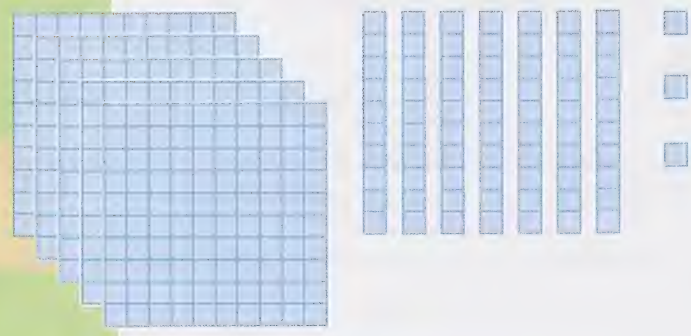
Everything relates back to your understanding of place value. Look at this problem:

$$\begin{array}{r} 573 \\ -\ 179 \\ \hline \end{array}$$

If you start it like the last one you run into a problem right away. The 9 is too big to subtract from the 3 in the ones digit.

Reflection

What can you do to subtract 9 from 3? If you cannot subtract 9 from 3 how can you subtract 179 from 573?



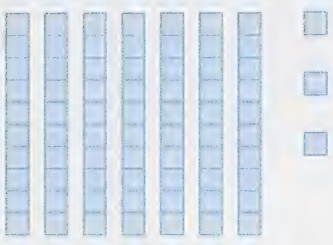
Let's Explore

Exploration 1: Borrowing

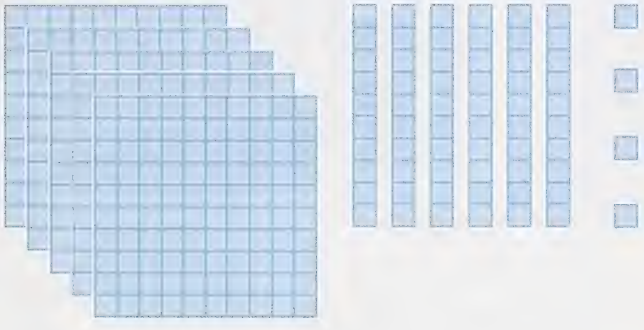
Materials: Unit 1, Lesson 10, Exploration 1 page from your Workbook, Hundred squares from the back of this Unit in your Workbook, Pencil, Scissors

Let's use Hundred Squares to model 573 – 179.

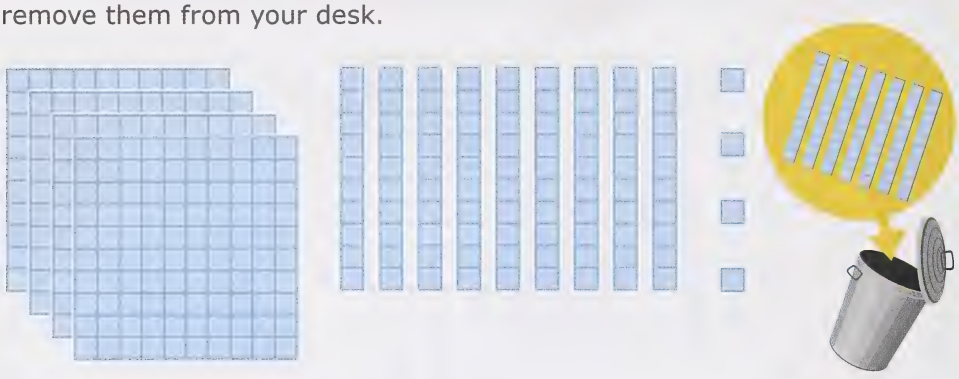
1. Make a model for 573 using the Hundred Squares.
2. Cut the Hundred Square that has the 7 tens and the 3 ones from your model down to 7 longs of 10 and 3 ones.



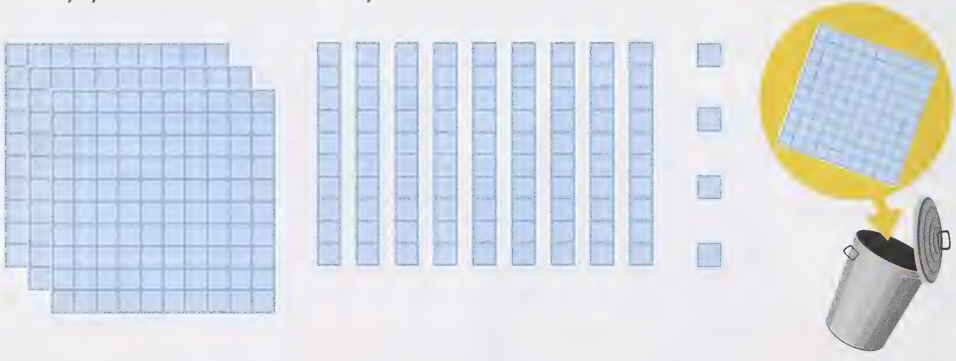
3. Take away 9 ones. You will need to cut one of your longs into 10 ones. Remove the 9 ones from your desk.



4. Now you need to take away 7 tens. You should only have 6 tens and 5 hundreds. Cut a hundred into 10 longs. Now take away 7 tens and remove them from your desk.



5. Finally you need to take away 1 hundred.



6. Complete this statement: 573 – 179 = _____

7. Use the same process to find the following:

   475 – 382 724 – 458 651 – 539

8. Reflect: Why do you think you should start by subtracting the ones rather than the hundreds?

Go online to watch the Notepad Tutor: Subtraction Including Borrowing.

Example 2

Subtract 2 328 – 1 539

1: Line up the place values for subtraction

$$\begin{array}{r} 2\ 328 \\ -\ 1\ 539 \\ \hline \end{array}$$

2: Borrow 10 from the 2 and subtract the ones

$$\begin{array}{r} 2\ 3\overset{1}{2}\overset{1}{1}8 \\ -\ 1\ 5\ 3\ 9 \\ \hline 9 \end{array}$$

3: Borrow 100 from the 3 and subtract the tens

$$\begin{array}{r} 2\ \overset{2}{3}\overset{11}{2}8 \\ -\ 1\ 5\ 3\ 9 \\ \hline 8\ 9 \end{array}$$

4: Borrow 1 000 from the 2 and subtract the 100s

$$\begin{array}{r} \overset{1}{2}\ \overset{12}{3}\overset{11}{2}8 \\ -\ 1\ 5\ 3\ 9 \\ \hline 7\ 8\ 9 \end{array}$$

2 328 – 1 539 = 789

Now It's Your Turn

Subtract.

a. 2 365 – 1 982

b. 456 – 298

c. 1 465 – 988

Solutions

a. 383

b. 158

c. 477

Exploration 2: Take Me Out to the Ballgame!

Materials: Unit 1, Lesson 10, Exploration 2 page from your Workbook, Paper, Marker

Answer the following questions using the information on the chart. Use the paper to find the answers, and write the final answers in your Workbook.

Baseball Card Collections	
Collector	**Number of Cards**
Zach	783
Lian	1 394
Cameron	567
Alyssa	1 210

1. How many more cards does Lian have than Zach?

2. Use front-end estimation to estimate about how many more cards Alyssa has than Cameron.
3. If Alyssa's goal is to collect 5 000 cards how many more does he need?
4. How many more cards does Lian need to collect to reach 2 000?
5. The Baseball Museum has a collection of 9 400 baseball cards. If all four kids added their cards together how many more cards does the museum have?

Estimation

With subtraction, you can use the same methods for estimation that you used with addition. You should recall that those were:

Front-End Estimation Compatible Numbers

You can use either of these, but you should always try to choose the one that is best for the situation.

Example 3

Estimate the solution of 4 328 – 2 789.

You should try both methods.

Front-End Estimation

Keep the first digit and replace the rest with zeros:

4 000 – 2 000 = 2 000

Compatible Numbers

For this you want to choose numbers that are closest to the given numbers but that subtract easily:

4 000 – 2 800 = 1 200

You can use either of these methods to get an approximate answer and you can also use them to get approximate answers when you check your work.

Example 4

Subtract 4 723 – 2 482. Estimate to check, writing the name of the strategy you used. Show your work.

Subtract.

$$\begin{array}{r} {}^{6}\not{7}^{11}23 \\ -\ 2\,482 \\ \hline 2\,241 \end{array}$$

Estimate to check.

In this case, let's choose compatible numbers.

4 723 is close to 4 700

2 482 is close to 2 500

So 4 700 – 2 500 = 2 200

Compare your answer to the estimated answer. They are close so the answer is probably correct.

4 723 – 2 482 = 2 241

Checked using compatible numbers, the answer looks correct.

Let's Practice

- In your Workbook go to Unit 1, Lesson 10 and complete 1 to 15.

Problem Solving

Subtraction word problems will have some key words that will let you know the operation.

less than	fewer than	decreased by	difference between	minus

When you see these key words, they should make you think – **SUBTRACT**!

Example 5

Nina has 15 fewer pairs of shoes than Daksha. Daksha has 28 pairs. How many pairs of shoes does Nina have?

What are you trying to find out?

The number of shoes Nina has.

What do you know?

Daksha has 28 pairs and Nina has "15 fewer pairs"

Write a number sentence.

28 – 15

Subtract.

28 – 15 = 13 pairs

Write the answer as a sentence:

Nina has 13 pairs of shoes.

You should always state the answer in a sentence to show that it is clear you know the answer to that first question: "What are you trying to find out?"

Let's Practice

- In your Workbook go to Unit 1, Lesson 10 and complete 16 to 21.

Math 4 Unit 1

Lesson 11

Decimal Subtraction

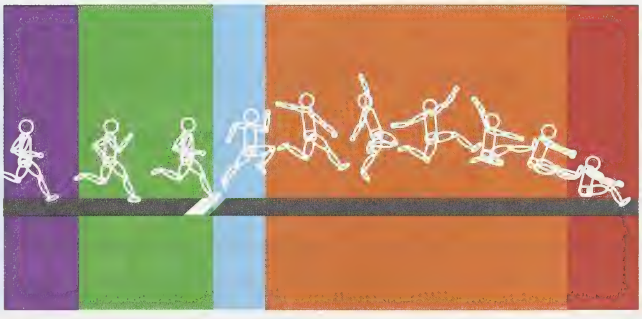
Record Holders

Being record holders for any track and field event is exceptional. Can you imagine completing a long jump of over 7 metres?

Several people have actually done this while competing in the Track and Field events. The long jump is a sport that has five distinct parts to it.

The parts are:

- the approach run
- the last two strides
- the take off
- the action in the air
- the landing



Long Jump Records		
Year	**Athlete**	**Jump Distance**
1982	Valy Ionescu	7.20 metres
1976	Siegrun Siegl	6.99 metres
1987	Jackie Joyner-Kersee	7.45 metres
1988	Galina Chistyakova	7.52 metres

How much further did Galina Chistyakova jump than Jackie Joyner-Kersee?

7.52 metres – 7.45 metres = 0.07 metres

Only 7 hundredths of a metre separated their scores!

Reflection

How much further did Valy Ionescu jump than Siegrun Siegl? How can you subtract two decimal numbers?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Subtract decimals to the hundredths
- Estimate using compatible numbers
- Use mental mathematics strategies to solve problems

Subtracting Decimals

Subtracting decimals is like adding decimals in that you need to make sure that the numbers are lined up by place value before subtracting. Remember, if you line up the decimals, the numbers will just fall into place.

Example 1

Cameron had $3.45 and just bought a key chain for $1.23. He decides to subtract to see how much money he has left:

3.45 – 1.23

Cameron lines up the decimals. Then he subtracts one place value at a time:

Hundredths	Tenths	Ones
3.45	3.45	3.45
– 1.23	– 1.23	– 1.23
2	.22	2.22

Notice how he brought the decimal down in the same place.

3.45 – 1.23 = 2.22

Cameron decides that he has $2.22 left.

That seems really easy. What can you encounter that is hard? You may remember borrowing to subtract large numbers. You can use the same method for subtracting decimals.

Subtracting Decimals using Models

Using Base 10 Blocks or Hundred Squares are good ways to understand the way you borrow in subtracting decimals.

Example 2

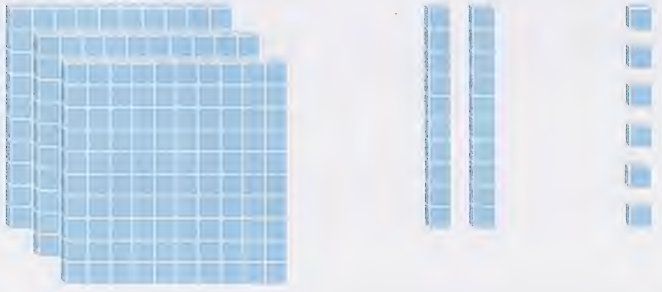
Daksha needs to pay $1.45 for his lunch. He has $3.26 in his pocket.

Subtract 3.26 – 1.45

He sees that he cannot take 45 cents from 26 cents. He knows he needs to borrow. He uses Base 10 Blocks to model the problem.

1: Create a model for the first number using Base 10 Blocks or Hundred Squares.

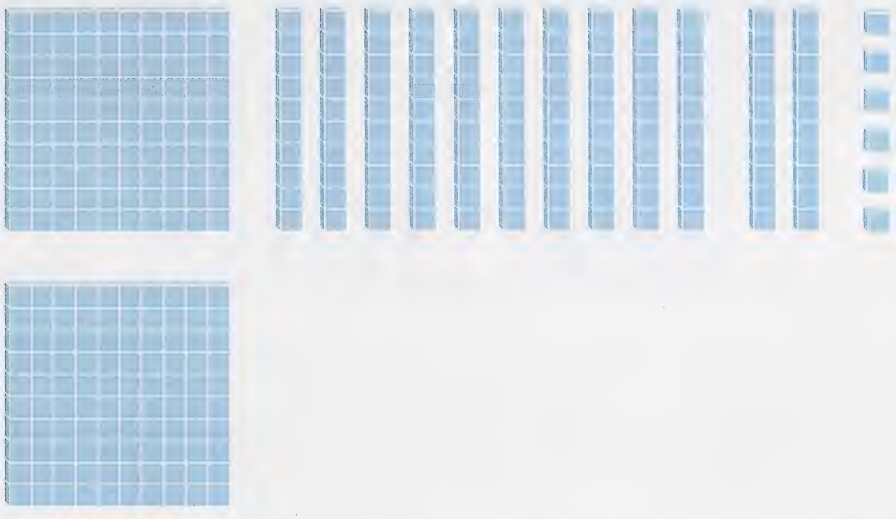
Base 10 Blocks for 3.26:



2: Take away 0.45 from your model.

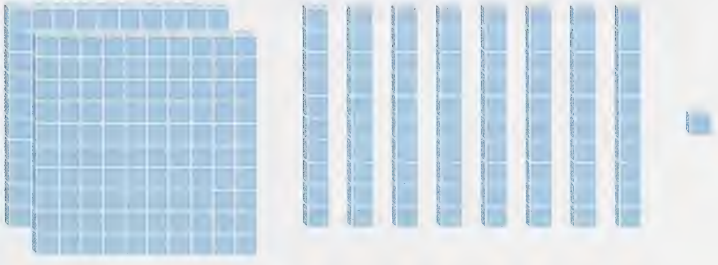
How do you take 0.45 away from 0.26?

You will need to break a ones flat down and combine the new blocks with the 0.26:



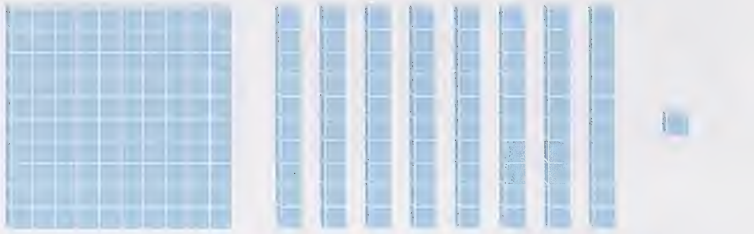
ones tenths hundredths

3: Now you can take away 4 tenths (longs) and 5 hundredths (unit cubes)



ones tenths hundredths

4: Subtract the ones. You need to take away 1. That will leave:



5: Figure out what you are left with. You are left with 1 flat, 8 longs and 1 small block.

3.26 – 1.45 = 1.81

Let's Explore

Exploration 1: Decimal Subtraction

Materials: Base 10 Blocks or Hundred Squares, Unit 1, Lesson 11, Exploration 1 page from your Workbook, Pencil, Paper

Find the difference between each pair of decimals. Use your blocks to model the first number. Break down ones and tenths as needed to take away the second decimal. Draw a picture of your answer and write the difference in standard form.

1. 3.49 – 2.34

   a. Draw the model of your answer.

   b. Write the answer:

   c. What models did you have to break down?

2. 1.28 – 0.34

   a. Draw the model of your answer.

   b. Write the answer:

   c. What models did you have to break down?

3. 5.27 – 4.39

   a. Draw the model of your answer.

   b. Write the answer:

   c. What models did you have to break down?

4. Create your own subtraction problem. It should require you to break down at least one value.

5. Reflect: When you look at a problem can you tell if you will have to break down a value? How?

Subtract Decimals using Place Value

Let's look at this in terms of place value:

There is nothing to borrow when subtracting the hundredths:

Ones	.	Tenths	Hundredths
3	.	2	6
1	.	4	5
	.		1

You will have to borrow from the ones place to get 10 tenths. Add these to the 2 tenths in order to be able to subtract 4:

Ones	.	Tenths	Hundredths
~~3~~2	.	12	6
1	.	4	5
1	.	8	1

Then, you can subtract the ones without a problem.

Sometimes you may not want to draw a place value chart for your problems. If that is the case, you can simply borrow by placing the value above the problem. Look at the following example to understand further.

Example 3

Subtract 12.93 – 4.87. Check your work by adding.

1: Line up the decimals; borrow from the tenths to subtract the hundredths:

```
      1
 12.8 13
- 4.87
------
      6
```

2: Finish subtracting by place values

```
      8
 12.9 13
- 4.87
------
  8.06
```

3: Check by adding the answer and the number you subtracted:

```
  8.06
+ 4.87
------
 12.93
```

Since the answer is the number you subtracted from, your answer is correct.

12.93 – 4.87 = 8.06

Go online to watch the Notepad Tutor: Subtracting Decimals with No Place Holder.

Now It's Your Turn

Subtract. Check your work by adding.

a. 5.67 – 2.16

b. 15.45 – 9.86

c. 45.7 – 12.85

Solutions

a. 3.51

b. 5.59

c. 32.85

Exploration 2: Estimating and Finding Differences

Materials: Unit 1, Lesson 11, Exploration 2 page from your Workbook, Index cards with digits 0 – 9 written on them, 2 index cards with decimal points drawn on them, Pencil

1: Arrange your cards so that you have two decimals numbers.
Place the decimal card after the third number.
Example of one number:

2: Write down your two numbers. Estimate the difference between the two numbers. Show your work.

3: Find the actual difference of the two numbers. Show your work.

4: Now move the decimal-point cards one digit to the right.

5: Write down your two numbers. Estimate the difference between the two numbers. Show your work.

6: Find the actual difference of the two numbers. Show your work.

Reflection

How does the difference change when the decimals are moved to the right?

Estimating Decimal Operations

Front-end estimation and compatible numbers are two good ways to estimate subtraction solutions. You can use either of these methods to check your answer.

Example 4

Nina wants to know about how much she would have left if she spends $4.42 on socks. She has $10.71 right now.

Estimate the solution using front-end estimation and compatible numbers:

10.71 – 4.42

Front-end estimation: Keep the first digit and change the rest to 0.

10 – 4 = 6

Nina will have about $6 left.

Compatible numbers: Find numbers that are close to those given but have meaning you know you can work with.

10.75 – 4.50 = 6.25

In this case you could use 0.75 and 0.50 because that is like having $0.75 – $0.50 which should be easy for you to subtract. With money problems you can use quarters to estimate.

10.71 – 4.42 = about 6.25 Nina has about $6.25 left.

Mental Math Strategies

You have already learned to use compatible numbers for estimation. It allows you to get an estimate to your problem. This allows you to check your answer. Maybe you can do questions in your head. By using compatible numbers you can check answers. They help you reflect: Is my answer reasonable?

Example 5

Subtract 4.56 – 1.27

Here is one way to solve a subtraction question in your head:
It may be easier for you to work backwards.

1.27 + _____ = 4.56

Think of 0.56 – 0.27 separate from 4 – 1. Think of them as addition questions.

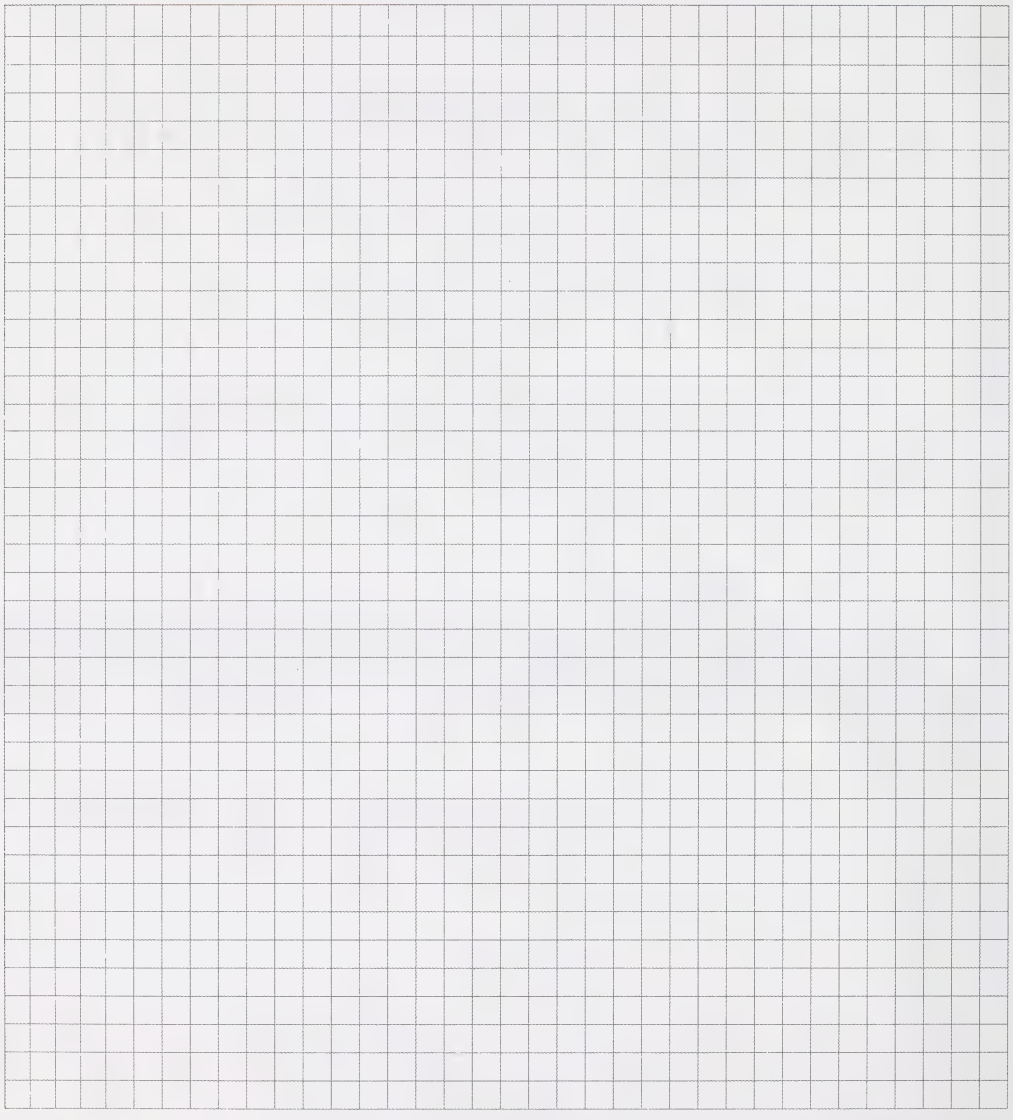
$$\begin{array}{r} 0.27 \\ +\ \_.\_\_ \\ \hline 0.56 \end{array}$$

So you need to add 0.29 to make 0.56. Add that to the 3 you get from 4 – 1.

4.56 – 1.27 = 3.29

Let's Practice

- In your workbook go to Unit 1, Lesson 11 and complete 1 to 25.



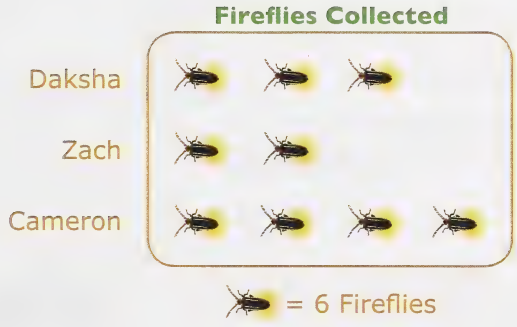
Math 4 Unit 1

Lesson 12

Basic Multiplication Facts

Camping Collections

Daksha, Zach and Cameron's families went camping together in the Waterton Lakes National Park. The boys decided to collect fireflies the first night. Here is a pictograph of the fireflies they collected:



Daksha collected 6 fireflies for each picture in the graph.

That means he collected 3 x 6 fireflies.

Zach collected 6 fireflies for each of the 2 in his graph.

That means he collected 2 x 6 fireflies.

Cameron collected 4 x 6 fireflies.

Reflection

How do you find the number of fireflies for each boy? What basic facts of multiplication do you recall from grade 3?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Learn multiplication facts to 9 x 9
- Use arrays to represent multiplication
- Describe and apply mental math strategies

Multiplication Facts

In grade 3 you were expected to learn your multiplication facts for 1s to 5s. Now you need to know the 6s to the 9s.

Why should you learn them?

You can think of them as "walking around information" for mathematics.

You need to know simple things to be in the world.

You might go to a store to get food.

What would happen if you don't know to pay?

You might go to school.

What if you don't know the dress code?

Multiplication facts are one of the basic pieces of information you need in math. You can take math without them, but it will get really hard. Having them in memory as "walking around information" will make math much easier!

Repeated Addition

Multiplication can be learned as repeated addition.

Here are 6 groups of 2 smiles:

The number of smiles can be written as an addition sentence:

$2 + 2 + 2 + 2 + 2 + 2 = 12$

It can also be written as a multiplication sentence:

$2 \times 6 = 12$

Example 1

Write an addition sentence and a multiplication sentence for the picture:

Addition sentence: 6 + 6 + 6 = 18

Multiplication sentence: 6 x 3 = 18

Go online to complete the Concept Capsule: Mental Math Strategies for Basic Multiplication Facts (to 5 x 5).

Multiplication Facts Table

Another method of recalling your basic facts is completing a Multiplication Facts Table:

x	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

You should recall that to read the table you look at a row and column together. The answer to 3 x 5 is found by looking at the 3 row and the 5 column:

x	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

The table shows that 3 x 5 = 15.

Exploration 1: Multiplying 6s to 9s

Materials: Unit 1, Lesson 12, Exploration 1 page from your Workbook, Counters such as beans or small candies, Pencil, Blank multiplication chart from the back of this Unit in your Workbook

You have already learned the multiplication facts from 1s to 5s.

1. Fill in all of these facts on your multiplication chart. If you do not remember them, use the process for finding 6s to 9s.

Now you need to find the answers to multiplication facts from 6s to 9s. Use counters to model each fact. Here is a model of 2 x 7:

Arrange your counters in 7 groups of 2 to model the problem. Since there are 14 counters in the arrangement the answer is 14.

2. After you make each multiplication fact with your counters, fill in the multiplication chart.
3. What do you notice about 2 x 7 and 7 x 2?
4. How would you describe the answer to 1 x any number?
5. Do you notice any other patterns in the multiplication chart?

Multiplying with Arrays

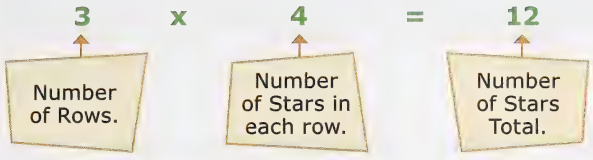
When you start multiplying larger numbers you will really want to know your basic facts from 1s to 9s. If you do not remember them all, you can create an array to visualize them.

Think:
Count the rows: there are 3 rows

Count the stars: there are 4 stars in each row

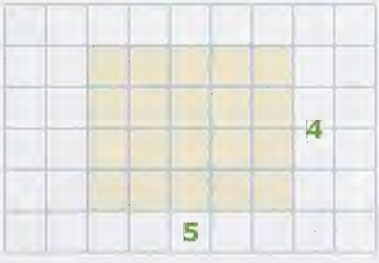
Here is an array:

Write: The multiplication sentence:



Using grid paper is a great way to create arrays quickly.

4 x 5 = 20



Simply shade the squares to represent 4 rows of 5.

Reflection

How many rows would you shade for 6 x 3? How many squares in each row? How is that different from 3 x 6?

Let's Practice

- Turn in your Workbook to Unit 1, Lesson 12 and complete 1 to 8.

Mental Math

Another way to work out your problems with multiplication facts is to use mental math strategies:

Counting Up

You may not know the answer to 6 x 7.

If you know 6 x 6 = 36 then you can find 6 x 7 by counting up 6 more.

6 x 6 = 36 so 6 x 7 = 36, 37, 38, 39, 40, 41, (42)

This works because multiplication is just repeated addition:

6 x 6 = 6 + 6 + 6 + 6 + 6 + 6 = 36

6 x 7 = 6 + 6 + 6 + 6 + 6 + 6 + 6 = 42

Skip Counting

You can use skip counting to find a basic multiplication fact.

3 x 4

You can skip count on a number line:

Count by 3s 4 times:

3 6 9 12

Either way, your answer is 3 x 4 = 12.

This is an example of skip counting starting from a known fact.

Example 2

Daksha needs to find out the answer to 3 x 6. How did he find the answer?

Daksha does not know 3 x 6. He does know that 3 x 5 = 15.

Think: 3 x 6 is one group more than 3 x 5:

3 x 5

3 x 6

Rather than draw a model Daksha thinks: 3 x 5 = 15 + 3 = 18

Doubling

When finding the answer to your 4s you can use the strategy of doubling.

4 x 3

Here is why it works:

2 x 3 = 6

4 x 3 = 12

The model of 2 x 3 doubled is 4 x 3.

This means that you can double the answer to 2 x 3 to get 4 x 3.

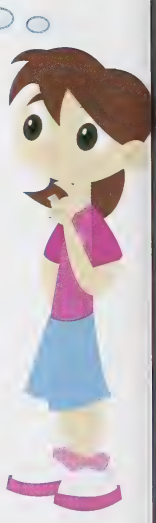
Think: 2 x 3 = 6 so 4 x 3 = 6 + 6 = 12

Example 3

Alyssa wants to find 4 x 8.

Alyssa thinks:

2 x 8 = 16.
So I can
double the 16
to get 4 x 8.
16 + 16 = 32
That means that
4 x 8 = 32!



You can also use this method to find the 6s if you know your 3s.

6 x 8 is 3 x 8 doubled

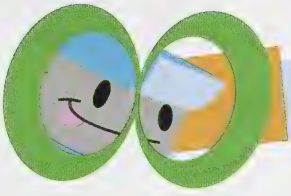
3 x 8 = 24 so 6 x 8 = 24 + 24 = 48

Reflection

What other set of facts can you use the method of doubling?

Nine's Patterns

The 9's facts have a pattern that is part of the digits for each product. You can find it using Exploration 2.



Exploration 2: Pattern of the 9s

Materials: Unit 1, Lesson 12, Exploration 2 page from your Workbook, A red and a blue pencil crayon

There is a pattern to the 9's facts. Look at the 9s in the Multiplication Table:

x	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5	6	7	8	9
2	2	4	6	8	10	12	14	16	18
3	3	6	9	12	15	18	21	24	27
4	4	8	12	16	20	24	28	32	36
5	5	10	15	20	25	30	35	40	45
6	6	12	18	24	30	36	42	48	54
7	7	14	21	28	35	42	49	56	63
8	8	16	24	32	40	48	56	64	72
9	9	18	27	36	45	54	63	72	81

1. Complete the table using two colours. Write the tens digit of your answer in blue and the ones digit of your answer in red.

Fact	2 x 9	3 x 9	4 x 9	5 x 9	6 x 9	7 x 9	8 x 9
Product							

2. Look closely at the relationship between the facts and the answer.
3. Do you notice any pattern to the relationship?
4. Look at the tens digit. How does it relate to the number multiplied by 9?
5. What do you get when you add the tens digit and the ones digit?
6. Describe the pattern.

Example 4

Cameron is learning his 9s. He needs to find 5 x 9. Here is his method:

Cameron thinks: One less than 5 is 4.	4
4 + what number = 9?	4 + 5 = 9
The answer is 45.	45

The nines have this pattern that will help you find the answer. Simply follow Cameron's process.

Doubling and Halving

If you cannot recall a fact, this strategy may work. You can double one number and take half of the other.

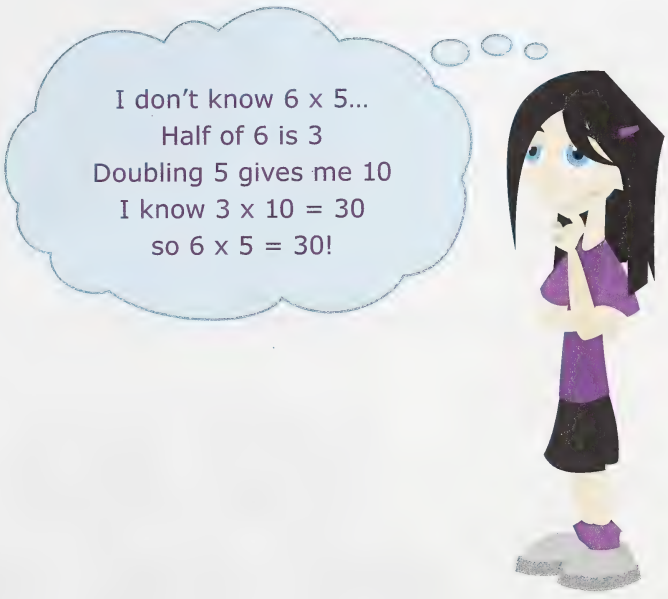
Reflection

Will doubling one number and taking half of the other make a fact that I know?

Example 5

Nina needs to find 6 x 5. She says that she can use doubling and halving for this problem:

Nina thinks:



Let's Practice

- Turn in your Workbook to Unit 1, Lesson 12 and complete 9 to 33.

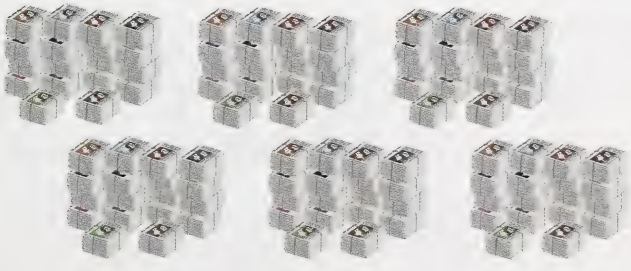
Lesson 13

Multiplying 2 or 3 Digits by 1 Digit

Pitching In

Alyssa, Nina, and Lian are working together to start a recycling campaign. Their neighbours are able to recycle 18 kilograms of paper in a month.

After 6 months, how many kilograms of paper should they have collected?



Lesson 13: Multiplying 2 or 3 Digits by 1 Digit

Reflection

How do you multiply these numbers? Could you use a mental math strategy?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Describe and apply mental math strategies
- Multiply 2- or 3-digits by 1-digit numbers
- Apply the distributive property
- Apply the property of 0 and 1 for multiplication

Multiplying 2- or 3-digits by 1-digit numbers

Once you have your basic facts you are ready for bigger problems. You may need a way to multiply large numbers using concrete models. You can use Base 10 Blocks to multiply 2-digit or 3-digit numbers.

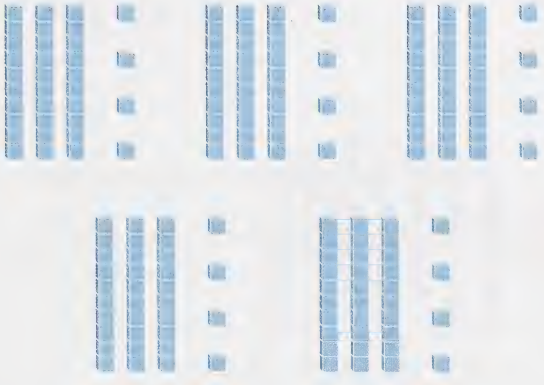
Let's Explore! For this example use Base 10 Blocks or Base 10 Models on your desk to help you follow along.

Example 1

Multiply 34 x 5

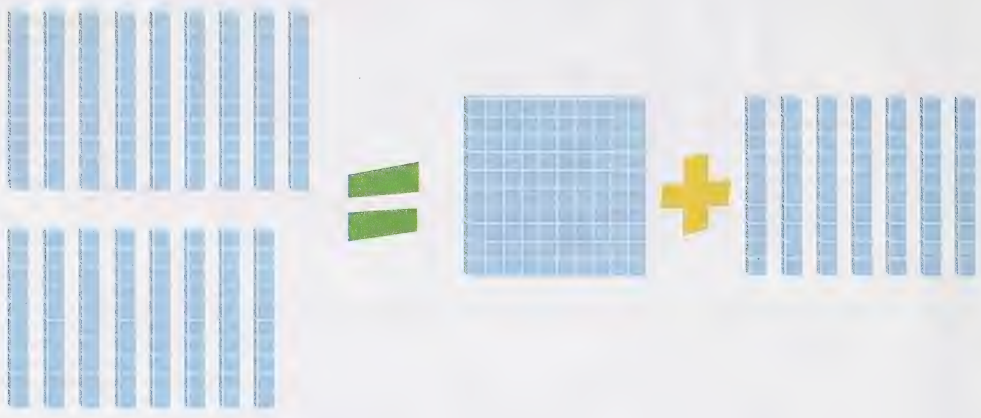
Gather the Base 10 Blocks for 34

Now imagine that you have 5 groups of these. If you have enough blocks, gather 5 groups.

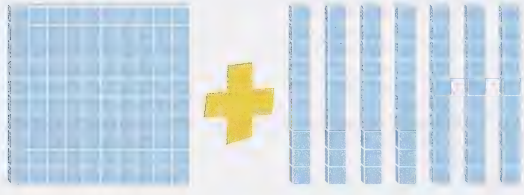


Now you should have 20 ones. That makes 2 longs and no ones.

You now have 17 longs. Remember, 10 longs make a flat. Trade 10 longs for a flat.



This is your solution:



1 flat = 100 and 7 longs = 70. The answer is 170.

Exploration 1: Multiply with Base 10 Blocks

Materials: Unit 1, Lesson 13, Exploration 1 page from your Workbook, Base 10 Blocks or Base 10 Models, Pencil, Paper

Gather blocks to model the problem. Answer the questions that follow.

1. 162 x 4

   a. How many unit cubes do you have?

   b. What is the number of longs + unit cubes that represent this number?

   c. How many longs do you have now?

   d. What is the number of flats + longs that represent this number?

   e. What is the product of 162 x 4?

2. 87 x 6

   a. How many unit cubes do you have?

   b. What is the number of longs + unit cubes that represent this number?

   c. How many longs do you have now?

   d. What is the number of flats + longs that represent this number?

   e. What is the product of 87 x 6?

3. 248 x 5

   a. How many unit cubes do you have?

   b. What is the number of longs + unit cubes that represent this number?

c. How many longs do you have now?

d. What is the number of flats + longs that represent this number?

e. What is the product of 248 x 5?

You may not always have Base 10 Blocks handy. You might get tired of carrying them around! Here are some other strategies for multiplying large numbers.

Example 2

Lian and Zach need to solve this problem: Multiply 24 x 3

Here are two strategies for multiplying a two-digit number by a one-digit number.

Lian uses this strategy...

Strategy 1: Use the **Distributive Property**

Use distributive property. This is when you break the 24 down to a sum of two numbers.

24 x 3 = (20 + 4) x 3 which is also written

= (20 x 3) + (4 x 3)

You can multiply the 3 by both parts of 24: 20 and 4, and then add those answers:

24 x 3 = 60 + 12 = 72

The answer is: 72.

This method could also look like this:

Align using place value.

$$\begin{array}{r} 24 \\ \times\ 3 \\ \hline \end{array}$$

Use distributive property as shown and add:

$$\begin{array}{r} 24 \\ \times\ 3 \\ \hline 12 \\ +\ 60 \\ \hline 72 \end{array}$$

3 x 4

20 x 4

Zach likes the following strategy better:

Strategy 2: Carrying

Line it up and use basic facts.

$$\begin{array}{r} 24 \\ \times\ 3 \\ \hline \end{array}$$

Start by multiplying 3 x 4. Since the answer is 12 you will need to carry the 1 to the tens column.

$$\begin{array}{r} {\scriptstyle 1} \\ 24 \\ \times\ 3 \\ \hline 2 \end{array}$$

Next multiply 3 times the 2 in the tens column. You get 6 but you must also ADD the 1 that you carried: 6 + 1 = 7

$$\begin{array}{r} {\scriptstyle 1} \\ 24 \\ \times\ 3 \\ \hline 72 \end{array}$$

Both kids came up with an answer of: 24 x 3 = 72

Example 3

Multiply 245 x 5

Using distributive property:

```
  245
x   5
-----
   25   <- 5 x 5

  200   <- 5 x 40
1 000   <- 5 x 200
-----
1 225
```

Using Carrying:

```
 2 2
  245
x   5
-----
1 225
```

Go online to complete the Concept Capsule: Understanding Distributive Property Using Base 10 Blocks.

Checking Your Answer

Checking answers may be done using estimation. You can use front-end estimation or you can use a compatible number.

Example 4

Multiply 28 x 4. Check you answer by estimating.

```
 3
 28
x 4
---
112
```

Begin by solving the problem using a personal strategy. Here we have used the Carrying Method:

To check, use a compatible number or front-end estimation:

Front-End estimation: 28 becomes 20: 20 x 4 = 80

Compatible number: 25 is a compatible number to 28. 25 x 4 = 100

The compatible number problem is closer to the original numbers so it is actually a better estimate than front-end estimation.

Our solution falls close to the compatible number solution so we know it is reasonable.

You can use properties of 0 and 1 to help you multiply large numbers.

Property of 0

You can model multiplication as the grouping of numbers. Here is a model for 5 x 2 = 10:

There are 5 groups of 2 stars which is a total of 10 stars.

Here is a model for 5 x 0 = 0:

There are 5 groups of 0 which is a total of 0 stars.

The **zero property of multiplication** states that multiplying any number by 0 will give a product of 0.

124 x 0 = 0 76 x 0 = 0 0 x 560 = 0

This property will help you solve problems quickly when 0 is any part of the numbers being multiplied.

Example 5

Daksha needs to multiply 130 x 7. Here is how he solved the problem:

Daksha's work:

130 ← 100 + 30
x 7
210 ← 30 x 7
700 ← 100 x 7
910

So why did Daksha ignore the 0 in 130? He didn't! He knew that 7 x 0 = 0 so he went on to the tens place.

Example 6

Alyssa needs to multiply 405 x 8. Here is how she solved the problem:

Alyssa's work:

$$\begin{array}{r} {\scriptstyle 4}\,405 \\ \times\quad 8 \\ \hline 3\,240 \end{array}$$

Alyssa used carrying.

First she multiplied 8 x 5 = 40 and carried the 4.

$$\begin{array}{r} {\scriptstyle 4} \\ 405 \\ \times\ \ 8 \\ \hline 0 \end{array}$$

Then, 8 x 0 = 0 and adding 4 to the 0 she got the 4.

$$\begin{array}{r} {\scriptstyle 4} \\ 405 \\ \times\ \ 8 \\ \hline 40 \end{array}$$

Finally, she finished with 8 x 4 = 32:

$$\begin{array}{r} {\scriptstyle 4} \\ 405 \\ \times\ \ 8 \\ \hline 3240 \end{array}$$

Property of 1

The **identity element** for multiplication is 1. This means that multiplying any number by 1 leaves the number unchanged.

Here is a visual model of 1 x 5 = 5:

There is 1 group of 5 which is a total of 5 stars.

This means that:

1 x 98 = 98 **18 x 1 = 18** **623 x 1 = 623**

Use the property of 1 to help you solve larger problems.

Example 7

Cameron is using the property of 1 and the distributive property to find the solution to:

311 x 6

Cameron thinks: 11 x 6 = 66 since 1 x 6 = 6 and 10 x 6 = 60.

300 x 6 = 1 800

To get the answer add 66 + 1 800

311 x 6 = 1 866

Mental Math

Another way to work out your problems with multiplication facts is to use mental math strategies:

Doubling and Halving

This method involves taking half of one number, and doubling the other to make a multiplication problem that you recall easily.

Example 8

Process for halving and doubling:	Sample Problem: 14 x 5
1. Double one number	5 doubled is 10
2. Take half of the second number	half of 14 is 7
3. Multiply	10 x 7 = 70

Therefore, 14 x 5 = 70

Tens Facts

A number with one or more zeros at the end may be broken down into a multiple of 10.

Exploration 2: 10s Facts

Materials: Unit 1, Lesson 13, Exploration 2 page from your Workbook, Pencil, Paper

1. Use the property of 0 and the property of 1 to find the 10's facts. Complete the table.
2. What do you notice about the pattern of the 10's facts?
3. How could you use this pattern to find 10 x 12? 10 x 15? 10 x 38?
4. Use the property of 0 and the property of 1 to find some of the 100's facts. Complete the table.

You are not supposed to memorize the 100s. You should be able to multiply by 100 easily. This will help you with large problems later in math.

5. Reflect: How is the 100's pattern similar to the 10s?
6. Reflect: How is it different than the 10's pattern?
7. Extend your thinking: How can you find 3 x 1 000 using the patterns you explored for 10s and 100s?

8. Reflect: How can you find 6 x 10 000 using the patterns you explored for 10s and 100s?

9. Write your own multiplication problem using these patterns and solve it.

10. Reflect: How did you get your answer?

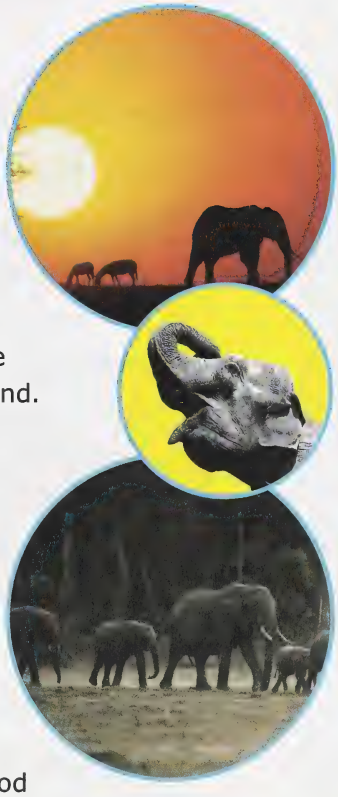
Let's Practice

- In your Workbook go to Unit 1, Lesson 13 and complete 1 to 28.

Lesson 14

Division

Elephants



Many people think of the wild animals when they hear the name Africa. Elephants are one of the most well known animals from this area of the world. There is a lot to know about these interesting creatures.

They are the largest land-dwelling mammals on Earth. They weigh between 5 000 and 7 000 kg and are around 2.5 m tall. One of their unique features is their trunk. It is a combination of a nose and upper lip that has two finger-like parts at the end. Believe it or not, they live up to 70 years and have excellent memories. Man is the only real threat to the elephants.

Another place that you can see elephants is at a zoo. Another really interesting fact about elephants is how much they eat. They eat grass, leaves, twigs, bark, fruit, and seed pods. Food is delivered to the zoos on a regular basis so that it is fresh and healthy. An average elephant will eat 150 kg of food per day. One delivery of elephant food is 15 000 kg.

Reflection

How do you think the zookeepers know how long this food will last?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Apply the property of 1 for division
- Divide 1- and 2-digit numbers by 1-digit numbers
- Use personal strategies for dividing
- Estimate quotients
- Relate division to multiplication

Division

Division is considered the **inverse** operation of multiplication. This means it is the opposite of multiplying.

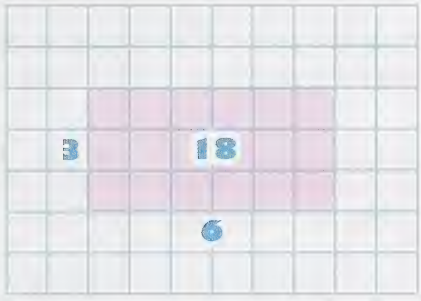
The inverse of $2 \times 8 = 16$ is $16 \div 2 = 8$.

OR

The inverse of $2 \times 8 = 16$ is $16 \div 8 = 2$.

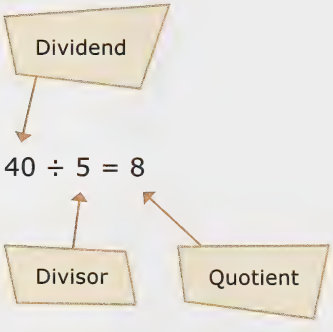
You used **arrays** to multiply with a model of the problem.

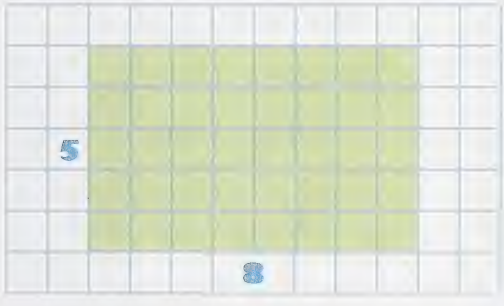
3 x 6 = 18



You can also use arrays for division.

You want to organize the **dividend** (the number being divided) into the number of groupings for the **divisor** (the number you are dividing by). The answer is called the **quotient**.





To make this array, 40 squares were arranged in 5 rows.
This made 8 columns.

Reflection

Is it important to know your basic multiplication facts to do division? Why?

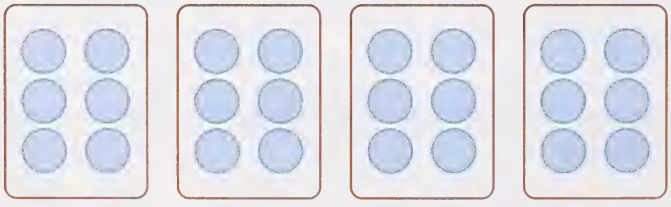
You can also use groupings to find the answer to division problems.

Let's explore! Use counters on your desktop with the next example. There are counters at the back of this Unit in your Workbook that can be cut out. You can also use things like dry beans, small candies, or large dry cereal.

Example 1

Solve 24 ÷ 6 using counters.

1. Gather 24 counters.
2. Put your counters in groups of 6.
   How many groups can you create?



3. The answer is the number of groupings of 6 that you were able to make from 24.

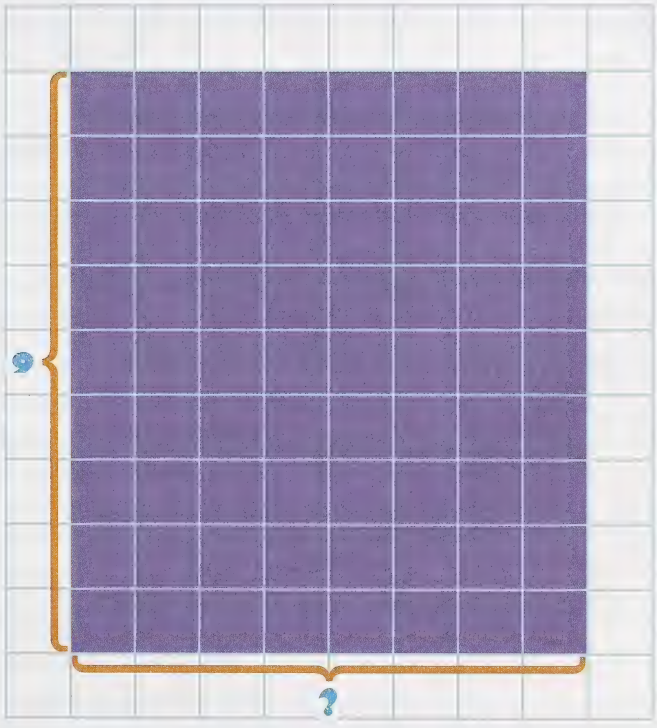
   $24 \div 6 = 4$

Let's explore! For the next example use grid paper from your workbook and model the problem as you read.

Example 2

Use centimetre grid paper to find the quotient: $72 \div 9 = ?$

1. Use centimetre grid paper to arrange 72 squares in 9 rows:



2. Count the number of columns you created. You should have 8.

   This means that 72 ÷ 9 = 8

Another strategy for solving division problems is thinking backwards. If you know your basic multiplication facts this one is easy.

Example 3

Solve 63 ÷ 7. Check by multiplication.

1. Think backwards: 7 x _____ = 63?

   If you know your basic facts, you know that 7 x 9 = 63

2. Relate that basic fact back to the problem given, so

   63 ÷ 7 = 9

3. You can check your solution using multiplication.
   The quotient times the divisor should equal the dividend.

   9 x 7 = 63 ✓

   63 ÷ 7 = 9

Now It's Your Turn

a. 42 ÷ 6 = ?

b. 30 ÷ 6 = ?

c. 12 ÷ 4 = ?

d. 56 ÷ 7 = ?

Solutions

a. 7

b. 5

c. 3

d. 8

Let's Explore

Exploration 1: Party Time

Materials: Unit 1, Lesson 14, Exploration 1 page from your Workbook, 50 counters, Pencil, Paper

It's your birthday and you are planning your party. You have invited 4 friends to a sleepover at your house. You have bought everything you need for your party. How much can each person have? (Remember: there are 5 people- you and 4 friends.)

1. Use your counters to represent the slices of pizza. Divide the pizzas evenly among all 5 of you.

2. Write the division problem and solve it.
3. Repeat instructions 1 and 2 for the juice and bananas.
4. Do you think that it is enough food and drinks for your party?

Reflection

If not, how much do you think you should buy? How much would each person get with the new amount of food? Show your work.

Dividing 2-Digit Dividends using Mental Math

Quotients are not always one-digit numbers. You may encounter larger 2-digit dividends. These will make 2-digit quotients. You can find these using mental math strategies. You may also use picture models such as arrays.

Example 4

45 ÷ 3 =?

Divide using mental math

1. Perform the method of counting up:

   Think: 3 x 12 = 36 and count up by threes to 45:

   36, 39, 42, 45

You've counted up 3 times so that is 12 + 3 = 15.

2. Check your answer. 3 x 15 = 45, so:

   The answer is: 45 ÷ 3 = 15

Let's Practice

- In your workbook go to Unit 1, Lesson 14 and complete 1 to 25.

Dividing 2-digit Dividends using Long Division

What if you don't want to use counters? What if you don't know your basic multiplication facts? What if the divisor will not go evenly into the divided? These are things that can happen and they lead to a process called **long division**.

Example 5

84 ÷ 6 =?

Using long division.

1: Set up your division problem as: $\text{divisor}\overline{)\text{dividend}}^{\text{quotient}}$

$6\overline{)84}$

2: Figure out how many times 6 goes into the first digit in the dividend

In this case 6 goes into 8 1 time. The 1 is placed above the 8.

$$\begin{array}{r} 1 \\ 6\overline{)84} \\ -6\downarrow \\ \hline 24 \end{array}$$

3: Multiply that by your divisor

1 times 6 is 6 and that is placed below the 8.

4: Subtract that from the first digit in the dividend

8 – 6 = 2 so write 2 below the 6.

5: Bring down the next number of the dividend.
Now how many times does the dividend divide the new number?

Bring down the 4. 6 goes into 24, 4 times.
Place the 4 in the quotient.

6: Repeat instructions 3 and 4.

Multiply 4 times 6 to get 24. Write it below the 24 and subtract. Notice that you get 0 and there are no more numbers in the dividend. That means you are finished!

$$\begin{array}{r} 14 \\ 6\overline{)84} \\ 6\downarrow \\ \hline \boxed{24} \\ 24 \\ \hline 0 \end{array}$$

7: Multiply the quotient times the divisor to check. If your answer is the dividend then it is correct.

$$\begin{array}{r} {\scriptstyle 2}14 \\ \times\ 6 \\ \hline 84 \end{array}$$

Multiplication works as a check for division since it is the inverse operation for division.

$84 \div 6 = 14$

Go online to watch the Notepad Tutor: Long Division 1-Digit Divisor by 3-Digit Dividend.

Estimating Results

To estimate your answer before using long division you can use compatible numbers.

Example 6

$96 \div 6 = ?$

1: Estimate your answer using compatible numbers:

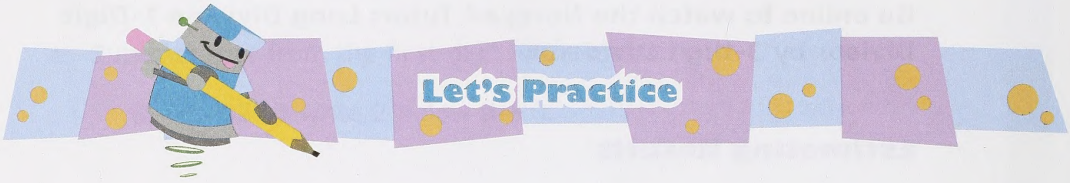
$100 \div 5 = 20$

2: Now divide.

$$\begin{array}{r} 16 \\ 6\overline{)96} \\ \underline{6} \\ 36 \\ \underline{36} \\ 0 \end{array}$$

As you can see, the quotient is very close to the estimate. That means you have a reasonable answer.

$96 \div 6 = 16$



- In your Workbook go to Unit 1, Lesson 14 and complete 26 to 41.

Go online to SuccessChecker and complete the Unit Test to check your understanding.

Go online to play a game that will help you review the glossary term.

ISBN 978-0-7741-3047-9